International Journal of Science Academic Research
Vol. 06, Issue 05, pp.9925-9933, May, 2025
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Research Article

NEED FOR INTENSIVE CARE UNIT ADMISSION, MORTALITY RATE AND ASSOCIATED FACTORS USING PAEDIATRIC ADVANCED WARNING SCORE (PAWS) ON ARRIVAL AT HOSPITAL: HOSPITAL BASED PROSPECTIVE STUDY

[1, 2, *]Matei Mselle, [1, 2]Bladina Mmbaga, [1, 2]Aisa Shayo, [3]Jeffrey Perlman, [1., 2]Esther Majaliwa, and [1, 2]Grace Kinabo

[1]Kilimanjaro Christian Medical College (KCMUCo), Tanzania
[2]Department of Pediatrics, Kilimanjaro Christian Medical Centre, Moshi, Tanzania
[3]Division of Neonatology, New York-Presbyterian-Weill Cornell Medicine, NewYork, USA

Received 10th March 2025; **Accepted** 12th April 2025; **Published online** 30th May 2025

Abstract

Background: Pediatric intensive care units (PICUs) are special areas of service to save the lives of children with life-threatening conditions/or critically ill children. Pediatric early warning scores can accurately identify up to 85% of children who will experience deterioration as early as 11 hours before, with specificity up to 95%. Delayed ICU admission has been reported to be associated with increase in mortality. **Objective**: To determine the need for ICU admission, mortality rate and associated factors using pediatric advanced warning score (PAWS) on arrival at Hospital. **Methodology**: This was a prospective observational cohort study, conducted among pediatric patients aged 1month-14yrs arriving through Emergency department at Kilimanjaro Christian medical center. Initial PAW score was done by trained senior resident then grouped into two groups critical score of ≥4, and none critical <4. Each patient was followed up until discharge where the outcome was recorded and matched with the PAW scored.Data were analyzed through SPSS version 25; logistic and poison regression model were used to measure the association and comparison between groups was done by non-parametric 2 independent sample. **Results:** 310 were enrolled during study period,35.4%(n=110) were admitted in ICU. The median age was 29 and 21 months for all participants and for those admitted to ICU, respectively. 80% of ICU admission had critical PAW score on arrival, with significant association (p<0.001).There was statistically significant difference between critical score and non-criticalin need for admission Mann-Whitney test (p<0.001). Overall ICU mortality rate was 52.7%(n=58). Those who died, 86.2%(n=50) had critical score on admission, and there was statistically significance difference between critical score and non-critical in terms of mortality, Mann-Whitney test (p<0.001). Otherwise, those with critical PAW score were likely to stay longer in ICU. **Conclusion:** PAW score right on arrival at emergency can identify up to 80% of pediatric patient requiring ICU admission, thus maybe incorporated in ICU admission criteria in low and middle income countries. Critical PAW score on arrival have increased chance of death and staying longer in ICU.

Keywords: Pediatric advanced warning score, ICU admission, Mortality.

INTRODUCTION

Pediatric intensive care units (PICUs) are special areas of service to save the lives of children with life-threatening conditions/or critically ill children who requires close monitoring. This unit aims to decrease mortality in infants and children by both identifying, monitoring and treating critically ill patients who are considered at risk of dying (1). Improvement of Intensive Care Unit (ICU) care could lower the hospital death rate by 15-60% (2). Low and middle income countries (LMIC), and Sub-Saharan Africa are still struggling with high burden of critical illness in proportional to health system capacity, but the data describing pediatric critical care outcomes in this setting as well as details of pediatric ICUs are lacking (3). The first 24 hours spent in emergency care in hospital represents the onset of definitive care for a child which is period that encompasses what is known as 'the golden hour', the 60-minute period closest to the acute event/exacerbation of which the critical care interventions are most beneficial in saving lives and reducing disability within this period of time (4). ICU may be mandated if the patient experiences physiological instability requiring frequent monitoring of vital signs, invasive hemodynamic monitoring, rapid titration of intravenous medication with concurrent monitoring, or respiratory support (5). Delayed ICU admission has been reported to be associated with increase in mortality(6) For early identification, use of pediatric early warning score (PEW) has been expanded to pediatric emergency department, and has been associated with level of care deposition and can serve as tool for ICU admission (7). Studies has been directed toward use of these warning scores which uses Solly vitals due to association between severely deranged vitals and occurrence of negative outcome such as ICU transfer, cardiac arrest and mortality (8). They can accurately identify up to 85% of children who will experience clinical deterioration or adverse events, as early as 11 hours before (9). Furthermore Meta analysis study showed implementation of pediatric early warning scores reduces the hospital mortality in children (10). Modified early warning score(PAWS) at emergency department for quick assessment although its poorly implemented in low resource setting (11). Modified Pediatric early warning score(PAWs) identify patients requiring PICU admission with a sensitivity of 70% to 100% and a specificity of 90% to 95.4%, right on arrival at EMD (11,12), and has strong correlation with PIM2 (Pediatric Index of mortality score) which is designed for higher resource settings, example PEWS results ≥4 had been reported also to have had a higher Pediatric Index of Mortality 2 (PIM2) (13). A report from Muhimbili the National hospital in Tanzania, revealed the

Corresponding Author:** ***Matei Mselle,
Kilimanjaro Christian medical college (KCMUCo), Tanzania.

increasing trend of mortality rates in the Acute Pediatric Care Unit (APCU) as follows: in 2014 (41.4%), in 2015 (39.2%), and in 2016 (45.3%) and the majority occurring in 24hrs (14).With estimated PICU mortality of 46.9% (15). It's also among the countries whereas human resources for health per population have not reached the WHO goals, example : 1 medical doctor per 20,010 populations while WHO recommends one (1) medical doctor per 4000 population, and one (1) nurse /midwife per 1374 populations while WHO recommends one (1) nurse/midwife per 492 populations. (16).

METHODS

Study Setting

This study was conducted at Kilimanjaro Christian Medical Centre (KCMC). KCMC is a tertiary referral hospital located in Northern Tanzania, with approximately 200 pediatric patients monthly attending the emergencydepartment (EMD). Children of 1month to 14years are admitted through EMD while neonates' bypasses EMD straight to neonatal unit. Those who requires admission are admitted in general pediatric ward, and surgical units. Has 3 intensive care units for pediatric patients, one with 5 bed capacity for general pediatric non-surgical patients and the other with 8 bed capacity, admitting children and adult, as well as the neonatal ICU with bed capacity of 8. Has only 2 ventilators that's suits all pediatric age group and more than 10 ventilators which can ventilate children above 6Kg.It offers level 3 ICU care according to recommendation by American academy of pediatrics consensus, and lacks pediatric intensivists, pulmonologist, critical care nurse, and cardiologist.

Study Protocol

Eligibility included children aged 1month to 14 years, arriving at EMD which is based on hospital admission protocol for pediatric patients. Neonates were excluded from the study as they bypass EMD as per hospital protocol, those who did not accept the consent, and those who died before being scored. Only those who met eligibility criteria were included. For eligible, the initial parameter to fill the PAW score form (**Figure 1**) was taken immediately before any intervention by senior resident, which includes Respiratory rate, heart rate, oxygen saturation, Temperature, level of consciousness using AVPU, level of distress, and severity of pain using pain scale. The score was added and filled up in database, by grouping those with score ≥4 as critical score and those with score <4 as none-critical. Then they were followed until discharge.

Data collection and analysis

Data were collected daily by senior resident and filled in prepared excel sheet. Information retrieved included Age of patient, sex, Initial PAW physiological parameters, presence or absences of chronic condition, Type of chronic condition referral status, admitting diagnosis. For ICU admitted, the date of admission, discharge or death, ventilator use, transfusion, inotrope need, and time spent. Datawas collected from October to April 2023 and reviewed daily for updates on outcome with study champions. Data were entered in SPSS version 25; logistic regression was used to measure association between initial PAW score and need for ICU admission by adjusting with other confounding factors and survival analysis model was used to determine survival and mortality in ICU. Then comparison between groups was done by non-parametric 2 independent sample.

Ethics

This project was approved by the KCMC ethics committee with data confidentiality prohibited to only researchers.

RESULTS

Over the study period, 310 patients who arrived through EMD were enrolled, where 110 were admitted to the intensive care unit (ICU). The median age of all participants attending EMD were 29 month and 21 months for those who went to ICU. Male were 61.4%(n=190) of all patients and 56%(n=62) for ICU admitted patients. More than half of ICU admissions were referrals 67.3% (n= 74). Nearly half 46.6%(n=145) attending EMD had chronic condition. The burden of admission was observed during the night and evening. Respiratory conditions predominated the general ward admission followed by GIT conditions, whereas in ICU respiratory conditions predominated followed by CNS conditions 41.8%(n=46) and 30%(n=33) respectively (**Table 1).**

Clinical profile of participants

Half 45.8% (n=145) of followed participants had critical PAW on arrival, The median score was 3 for non-critical and 7 for critical group. Common chronic condition encountered were congenital heart diseases which were 17.9% (n=26) of all participants and 33% (n=18) of ICU admitted patients. More than half of participants had their weight centile above 5%, only 36.12% had theircentile below 5%, about 35%(n=57) of this were admitted in ICU. Common complication encountered were shock for ICU patient and electrolyte imbalance for those who went to the general ward. Nasal prong was the common mode of oxygen deliveringamong those admitted in general ward and Ventilator for ICU admitted 41%(n=46), Majority of death occurred in the first week of admission (**Table** 2).

Statistical difference in PAW score among, ICU versus Non- ICU admitted patients

With confidence interval of 95% the median PAW score for ICU admitted and those who were not admitted were different and subjected to less error (shorter error bars) **(Figure 2**)

There was statistically significant difference in PAW score between ICU admitted and non-ICU admitted ($p<0.001$).

The ICU Admission rate using PAW score

Out of 310 patients who were followed with PAW score, 110 were admitted in ICU, Overall admission rate during study periodwas 35%. Among ICU admitted group with PAW score, 80% (n=88) had critical score on arrival (**Table 3**)

Factors associated with need for ICU admission in children with PAW score

Observed 310 patients who were enrolled during study period, logistic regression was used to determine association, crude and adjusted odds ratio was also recorded.Critical PAW score on arrival had significant association with need for ICU(AOR 9.4, $p<0.001$).

Table 1. Sociodemographic characteristic for all participants followed up from EMD

Variable	Total followed (N=310)	Percentage (%)	ICU admitted (n=110)	Percentage
Age in years				
<1yeas	96	30.87	46	42.2
1-<5years	114	36.66	31	28.4
5-9 years	67	21.54	19	17.4
10-15 years	33	10.93	13	12
Median, IQR (month)	**29, (10,69)**		**21(7,60)**	
Sex				
Male	190	61.41	62	56
Female	120	38.59	48	44
Referral status				
Home	186	60	36	32.3
From other hospital	124	40	74	**67.3**
Time of Arrival at EMD(268)			**In ICU**	
Night (10:00PM-1:59AM)	64	24.06	41	**37.3**
Evening (6:00PM-9:59PM)	64	24.06	22	**20.2**
Early Morning (2:00AM-5:59AM)	47	17.67	18	16.4
Afternoon (2:00PM-5:59PM)	39	14.66	14	12.7
Midday (10:00AM-1:59PM	28	10.53	4	3.6
Morning (6:00AM-9:59AM)	24	9.02	11	16.4
Preexisting Chronic illness/Congenital Condition				
Present	145	46.62	54	48.6
Absent	165	53.38	56	**51.4**
Affected System/Disorder				
Respiratory	100	32.15	46	41.8
Central Nervous System	61	19.61	33	30
Cardiovascular	16	5.14	9	8.2
Genitourinary	17	5.47	3	2.7
Gastrointestinal	66	21.22	6	5.5
Other	51	16.40	11	10

Table 1. Clinical characteristics of all participants

Variable	Total followed up (N=310)	Percentage (%)	ICU admitted N=110)	Percentage
Paw Score at Admission				
Critical (≥4)	142	45.80	88	79.8
Non critical	168	54.10	22	20.2
Median, IQR (PAW score)	**3, (1,6)**		**7(4,9)**	
Type of chronic illness/Congenital anomaly (n=145)				
Congenital heart disease	26	17.9	18	**33.3**
Cerebral palsy	22	15.2	8	14.8
Down syndrome	11	7.8	7	12.9
Hydrocephalus	15	10.3	4	7.5
Hirschsprung	8	5.5	2	3.7
Diabetes	5	3.5	2	3.7
Epilepsy	7	4.8	1	1.9
Hernias	7	4.8	0	0
Others	43	30.2	10	18.5
Weight Centile				
<5th percentile	112	36.12	57	**35**
5-25th percentile	49	15.8	40	16
>25th percentile	149	48.06	13	7
Complication (82)	**n=32**		**n=50**	
Fluid refractory shock	0	0	26	52
Fluid responsive shock	0	0	5	10
Electrolyte imbalance	3	9	6	12
Aspiration pneumonia	1	3.1	5	10
Others	28	87.5	8	16
Mode of oxygen delivering	**n=158**		**n=110**	
Ventilator	0	0	46	41.8
Nasal prongs	62	39.2	41	37.3
CPAP	2	1.3	9	8.2
T-piece	0	0	6	5.5
None	91	57.6	6	5.5
Face mask	3	1.9	2	5.5
Intervention (158)	**n=158**		**n=110**	
Need for Inotropes	9	5.6	52	47.71
Need for Chest Compression	9	5.6	45	41.28
Need for Transfusion	6	3.8	17	21.10
Death	**n=158**		**n=110**	
Yes	9	5.7	58	51.38
No	149	94.3	53	48.62
Time of Death	**n=9**		**n=58**	
First 24hrs of arrival	4	2.5	13	24.56
1st week	4	2.5	31	52.63
Beyond 1st week	1	0.6	14	22.81
Duration of stay in PICU			**n=110**	
<1 Day	2	22.2	16	14.6
1-7 Days	7	77.8	59	53.6
>7 days	-	-	35	31.8

Table 2. ICU admission rate

ICU admission rate (critical PAW) N=142	ICU admission rate non critical PAW N=146
• 88 of all 142 were admitted in ICU • ICU admission rate was 62% • 80% of all ICU admission	• 22 of 146 were admitted in ICU • ICU admission rate was 15% • 20% of all ICU admission

Table 3. Factors associated with need for ICU admission

Variable	Frequency (n)	ICU admitted		COR (95%CI)	p-value	AOR (95%CI)	p- value
		Yes	No				
Age							
>1year	214(69.1)	31	83	Ref		Ref	
≤1year	96 (30.9)	46	50	2.1(1.3,3.5)	0.004	2.4(1.09,5.16)	0.028*
Referral status							
Home	186	36	15	ref		Ref	
From other hospital	124	74	50	6.2(3.7,10.3)	<0.001	5(2.4,10.40)	<0.001*
Preexisting Chronic illness/Congenital Condition							
Absent	165(53.38)	56	109	ref		Ref	
Present	145(46.62)	54	91	1.15(0.7-1.8)	0.54	1.14(0.49,2.67)	0.76.
Type of chronic illness/Congenital anomaly(n-145)							
Congenital heart disease	26(17.9)	18	8	4.8(2.2,10.9)	<0.001	2.5(1.02,6.03)	0.04*
Cerebral palsy	22(15.2)	8	14	1.1(0.5,2.8)	0.5		
Down syndrome	11(7.8)	7	4	2.3(0.35,14.87)	0.4	1.6(0.26,9.41)	0.6
Weight Centile							
≥5th percentile	198(63.9)	9	40	ref		Ref	
<5th percentile	112(36.1)	37	75	2.8(1.7,4.6)	<0.001	2.3(1.08,5.01)	0.032
Paw Score at Admission							
Non critical	168 (54.10)	22	146	ref		Ref	
Critical (≥4)	142(45.80)	88	54	10.8(6.1,18.9)	<0.001	9.4(5.29,16.67)	<0.001*
Increase in work of breath							
Normal	222(72.3)	44	178	ref		Ref	
Mildto severe distress	88(17.4)	36	18	13.5(7.4-24)		10(4.12,25.1)	<0.001*
Level of consciousness							
Normal	262(84.5)	66	196	ref		Ref	
Reduced(V,P,U)	48(15.5)	44	4	32(11-94)	<0.001*	40(11.9,139)	<0.001*
Capillary refill							
≥3second	19(6.1)	18	1	ref		Ref	
<3second	291(93.9)	92	199	38.9(5-296	<0.001*	18(1.74,190.9)	0.015*

Table 5. Factors associated with mortality in ICU among pediatric patients

Variable	Frequency(n)	Death		CHR, CI 95%	p- value	AHR, CI 95%	p-value
		Yes	No				
Age							
>1year	63(57.3)			Ref		Ref	
≤1year	47(42.7)	33	14	1.8(1.0,2.9)	0.02*	1.3(0.7,2.8)	0.7
Referral status							
Home	36(32.7)	16	20	Ref		Ref	
From other hospital	74(67.3)	42	32	1(0.8,2)	0.2	0.12(0.9,5.2)	0.12
Preexisting Chronic illness/Congenital Condition							
Absent	56 (51.8)	21	35	Ref		Ref	
Present	54(48.62)	31	23	1.1(0.7,1.9)	0.2	1.1(0.47,2.27)	0.85
Type of chronic condition							
Congenital heart disease	18(33.3)	11		1.2(0.7-1.9)	0.35	1.2(0.42,3.32)	0.8
Weight centiles							
≥5th percentile	53	23	30	Ref		Ref	
<5thpercentile	57	35	22	1.6(0.9,2.7)	0.058	1.3(0.39,4.57)	0.64
Complication.							
Shock	31(43.3)	25	6	4.2(1.7,10.2)	0.001	6(2.15,16.64)	0.001*
Fluid refractory shock	26	25	1	39(4.9,299)	0.001	39(5.03,308)	0.001*
Paw Score at Admission							
Non critical	22(20.1)	8	14	Ref		Ref	
Critical (≥4)	88(79.8)	50	38	1.3(0.8-2)	0.09	2.6(0.93,7.24)	0.07
Mode of oxygen Delivering					-		
Ventilator	46(41.8)	6	40	6.5(2.7,15)	<0.001	16(5.83,47.1)	<0.001*
Intervention							
Need for Inotropes	52(47.7)	4	48	57(16.8,196)	<0.001	50(13.0,196)	<0.001*
Need for Chest Compression	46(41.3)	1	45	45(6.2,332)	<0.001	52(5.07,529)	0.001*
Need for transfusion	23(20.9)	6	17	2.8(1.1-7)5	0.03*	2.3(0.98,5.6)	0.082

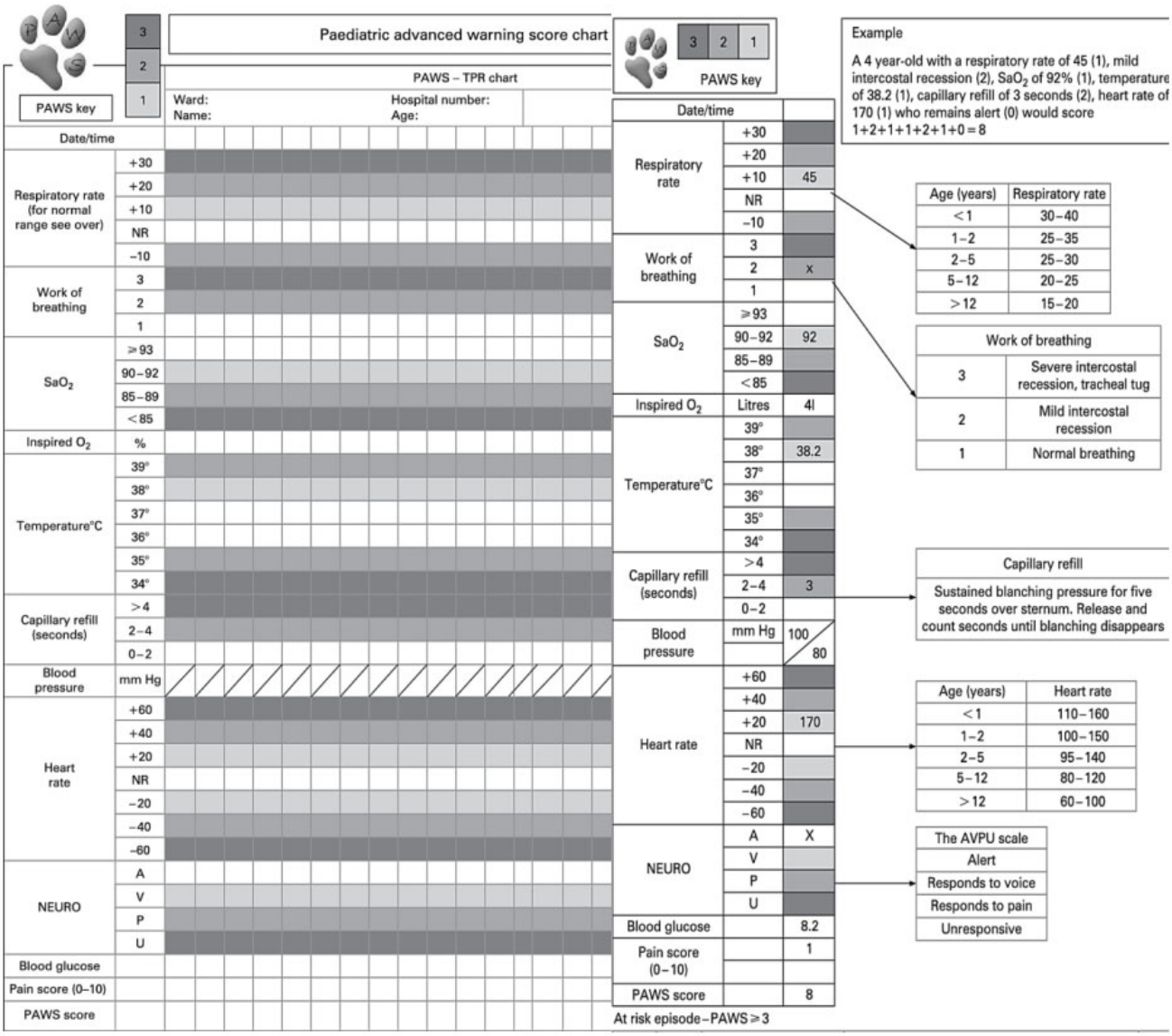

Figure 1. PAW score chart

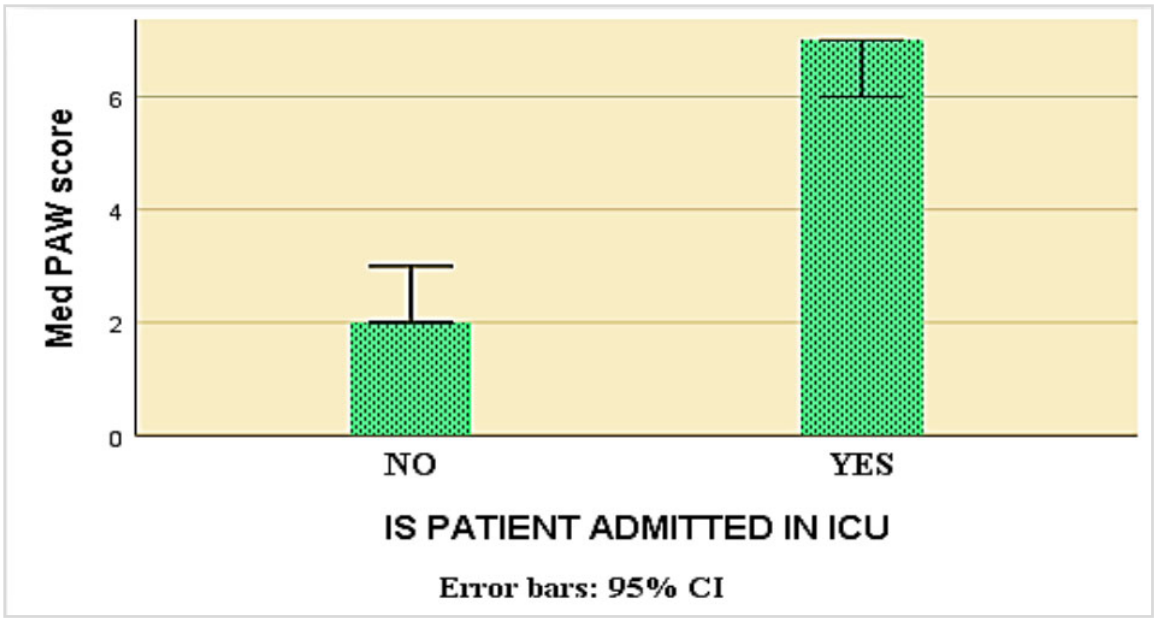

Figure 2. Simple error bar for median PAW score between ICU admitted and non-ICU admitted

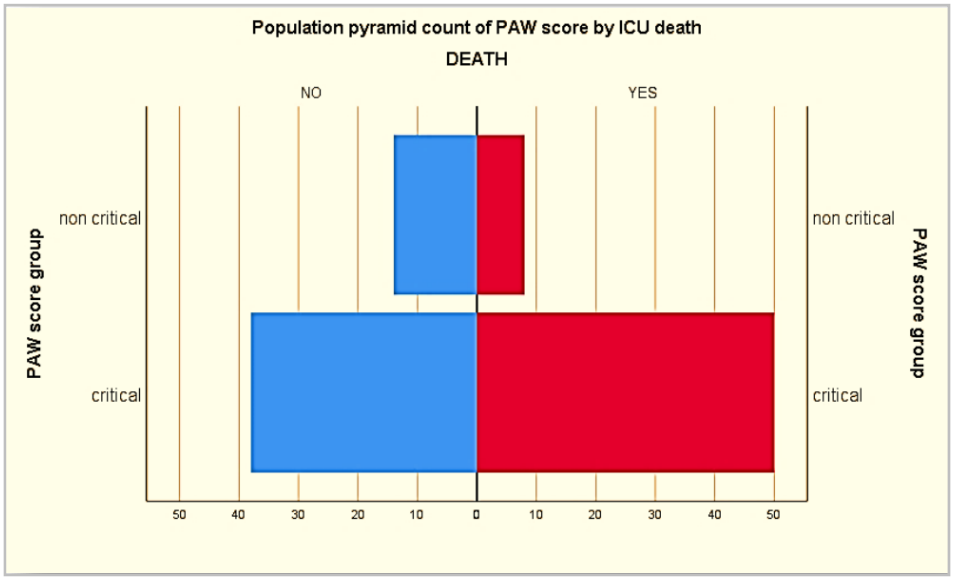

Figure 3. Population pyramid count of PAW score by ICU death

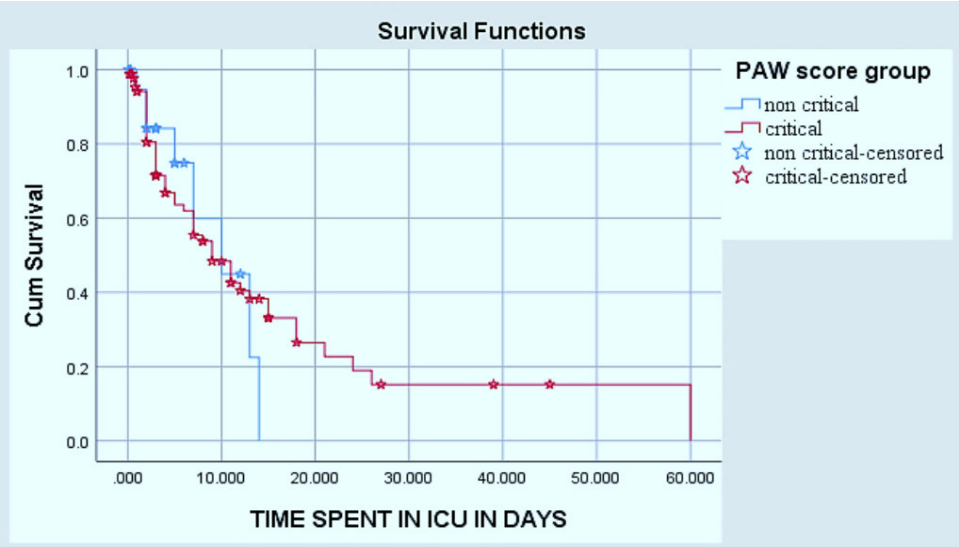

Figure 4. Survival function comparison between Critical PAW score and non-critical on arrival against time spent in ICU

Other factors includes increase work of breath mild to severe (AOR 10, p<0.001), Capillary refil≥3(AOR 18, p<0.001, age<1yrs(AOR 2.4,p 0.028), referral from peripheral hospital increases the OR by 5 (p<0.001)), Congenital heart disease (AOR 2.5,p<0.04), and extreme weight centile of < 5th percentile (AOR 2.3, p<0.032), Having**)** (**Table 4**).

Mortality rate among pediatric patient admitted in ICU with PAW score

Out of 110 patients admitted in ICU 58, died during the study period, with estimated mortality rate of 52.7%

About 86% (n=50) of those who died in ICU had critical PAW score on admission, and had longer ICU stay duration (**Figure 3, and 4**)

Factors associated with mortality among pediatric patients admitted in ICU with PAW score

Observed 110 participants who were admitted in ICU during study period, different factors from different studies were tested by poison logistic regression to obtain adjusted hazard ratio, Age <1 (AHR 7 p.0.012), Complication specifically shock (AHR 6, p.0.001), Mode of oxygen delivering used, ventilated patients (AHR 16, p<0.001), need for inotropes, chest compression, and transfusion (AOR 50, p<0.001, AHR 52, p<0.001, AHR 2.3) respectively,) **Table 5**.

DISCUSSION

An overall estimated ICU admission rate from this study was 35% whereas the critical PAW score rate of ICU admission was higher about 80%, when compared to 20% who had non critical score on arrival. It further pointed out the factors associated with ICU admission among patient arriving through EMD during study period where by PAW score of more ≥ 4 on admission, age less than 1 year, being referral from other hospital, extreme weight centiles of <5%, presence of congenital heart disease, reduced level of consciousness, increased work of breath from mild to severe and presence of sign of shock that was defined as capillary refill of ≥ 3. Over the study period overall mortality rate was estimated to be 52.7%.86% of all patients who died in ICU had critical PAW score on arrival. Factors associated with mortality, were shock,use of ventilator, need for chest compression, with

general increase in odds of dying without significant association for those with age less than or equal to 1-year, chronic condition such as congenital heart disease as well as extreme weight centiles.

ICU admission rate among those with critical PAW score

Tanzania is among the sub-Saharan African countries which are reported to have higher burden of critical illness as compared to other region of the world (3). An overall admission rate, was 35% which 3 times higher than Republic of Ireland and England which ranges from 124 to 181 per 100,000 (17). 80% of ICU admitted cases had PAW Score of ≥ 4(critical score) on arrival. This is similar to another study Rwanda which showed early warning score would identify up to 85% (9). Although this study bring into ground the rough estimate of admission rate and importance of use of PAW score for early identification, may over or under estimate the rate due to shorter duration of study, variation of seasons, late identification of critically ill children who would die in general ward and high burden of critical illness in sub-Saharan Africa compared to other regions (18).

Factors associated with need for ICU among pediatric patients admitted with PAW score

Children with critical PAW score of ≥ 4 were more than 3 times likely to be admitted in ICU,from this study the median PAW score for possible absolute ICU admission was 7,this agrees with study which showed median documented early warning score before ICU transfer of 6.3had significant association as well as good correlation with increase in PIM score (21). Age younger than 1 year were 2.4 times likely to be admitted in ICU,this may be explained by increased burden of critical illness in this age group, the results agrees with study done in Egypt and Saud Arabia which showed the higher odds of death among this age group (19, 20). Referred from other hospital was also significant factor, associated with need for ICU, which agrees with another study in Tanzania by (22). The possible explanation is physiological difference between children and adults may predispose into quick deterioration, which may further be altered by delayed referrals. Extreme weight centile as another factorwith significant association due to fact that, this children may be immunosuppressed, which makes them vulnerable to infectious disease and metabolic condition, Another study in Australia which reported not only they have risk of critical illness but also 2 times risk of dying if admitted in ICU (23). Other factors like shock and altered mental status, are also reported in multicenter studies (24). This implies the need to revise the management protocols and their implementation in ICU and recommendation to further study, it also encourage super specialization in critical care which will bring into ground more knowledge in handling the critical patients, in low and LMIC.

ICU mortality rate among pediatric patient admitted with PAW score

From this study the mortality rate was high about 52..7%, which is higher than overall ICU mortality of 41% reported in Tanzania 2014(25), But similar to study in Kenya and Malawi which found the mortality to 53.6% and 54.3% (18,26),other studies in similar setting reported lower mortality including Ethiopia 43.8% and Egypt 43.9% (5, 20). This may be attributed by, lack of equipment,inexperienced practitioners, as well as some practices which may be practiced in wrong way due to lack of experts. Prediction of patient outcome is important for the patients and family and is relevant for policy formulation and resource allocation, this result shows the contribution of PICU in hospital mortality. 80% of all patients who died in ICU had initial critical PAW score with an increased odds of death about 2.6 times likely to die, when compared to those with non-critical PAW score, also similar to study in USA which showed increase in odds of death by 1.3 to 1.4(13). This shows implementation of PAW may help in early identification of at risk children which can help in tightening the care to prevent mortality.

Factors associated with mortality among pediatric patients admitted in ICU with PAW score

This study combined factors from different studies, reviewed from different literatures, among the sensitive factors found were intervention factors. Those factors included need for inotropes from this study they were more than 5 times likely to die, more high odds for any resuscitated patient with chest compression of which they were 52 times likely to die even after adjusting with other confounders, and those who received transfusion 2.3 times likely to die, mechanically ventilated AHR of 16, as well as patient with shock who were found to be 6 times likely to die. This agrees with different studies in different countries like Indonesia, Ethiopia,and Kenya (5, 26, 27). Similar study also in Saudi Arabia showed association as well as higher odds among ventilated patients and inotropes use (28). So airs up the possibility of revising this practice by health practitioners and health facilities, as well as research gap in the world of science, specifically in low resource settings. Age is still an important factor both in need for ICU and increase in risk of death if admitted in ICU. Having chronic condition such as congenital heart disease and Down syndrome, increases the odds of death in ICU,so special awareness should be raised among children with this conditions, this concurs with another studies in USA (29). Extreme weight centiles < 5% in ICU also are important factor to address as they increase the odds of death about 1.3 AHR respectively, this may be explained by possibility of rapid deterioration as well as height risk of complication, this encompasses with other study in UK and Australia which also showed the increase in odds of death among this group (23, 30).

Limitations

This study has several limitations. It was single center study, which may be difficult to generalize the results.It was conducted over short period of time which my inaccurately estimate the rate. However, the consistency of the results and its agreement with other similar study, gives stronger reason to contribute in the world of science.

Conclusion

Solly vital based PAW score right on arrival at emergency can identify up to 80% of pediatric patient requiring ICU admission, thus maybe incorporated in ICU admission criteria in LMIC. Otherwise, critical PAW score on arrival have increased chance of death and staying longer in ICU. High ICU mortality of 52.7% and ICU admission still shows the high burden of critical illness in sub-Saharan Africa, thus consideration and resource reallocation are important. Other

studies to evaluate different interventions like use of inotropes, transfusion, and resuscitation practice e.g., Chest compression which may help to improve care in in ICU in LMIC. Otherwise, the identified factors may help or contribute in formulating ICU admission criteria in LMIC

Conflicts of Interests (including financial disclosures): The authors have no conflicts of interest to disclose.

Funding Declaration

This study received financial support from Good Samaritan foundation via department of paediatric and child health at Kilimanjaro Christian Medical center. The funder did not contribute to the study design, data collection, analysis, interpretation or manuscript writing.

Data Declaration
Data are available on reasonable request. All relevant generated data from this study are available from the corresponding author upon reasonable request.

Acknowledgements: We would like to thank Professor Grace Kinabo, Residents and all pediatricians at Kilimanjaro Christian medical center for their dedication and guidance in this study.

REFERENCES

1. Shen Y, Jiang J. Meta-Analysis for the Prediction of Mortality Rates in a Pediatric Intensive Care Unit Using Different Scores: PRISM-III/IV, PIM-3, and PELOD-2. Front Pediatr. 2021;9(August):1–13.
2. Dendir G, Awoke N, Alemu A, Sintayhu A, Eanga S, Teshome M, et al. Factors Associated with the Outcome of a Pediatric Patients Admitted to Intensive Care Unit in Resource-Limited Setup: Cross-Sectional Study. Pediatr Heal Med Ther. 2023;Volume 14(February):71–9.
3. Turner EL, Nielsen KR, Jamal SM, von Saint André-von Arnim A, Musa NL. A review of pediatric critical care in resource-limited settings: A look at past, present, and future directions. Front Pediatr. 2016;4(FEB):1–15.
4. Legend U, Erner EBRL, Oscati ROMM. The Golden Hour : Scientific Fact or Medical. 2000;2000–2.
5. Seifu A, Eshetu O, Tafesse D, Hailu S. Admission pattern, treatment outcomes, and associated factors for children admitted to pediatric intensive care unit of Tikur Anbessa specialized hospital, 2021: a retrospective cross-sectional study. BMC Anesthesiol. 2022 Dec 1;22(1).
6. Cardoso LTQ, Grion CMC, Matsuo T, Anami EHT, Kauss IAM, Seko L, et al. Impact of delayed admission to intensive care units on mortality of critically ill patients: A cohort study. Crit Care. 2011;15(1):1–8.
7. Bradman K, Maconochie I. Can paediatric early warning score be used as a triage tool in paediatric accident and emergency? Eur J Emerg Med. 2008 Dec;15(6):359–60.
8. Churpek MM, Yuen TC, Edelson DP. Predicting clinical deterioration in the hospital: The impact of outcome selection. Resuscitation. 2013 May;84(5):564–8.
9. Sridhar S, Schmid A, Biziyaremye F, Hodge S, Patient N, Wilson K. Implementation of a pediatric early warning score to improve communication and nursing empowerment in a rural district hospital in Rwanda. Glob Heal Sci Pract. 2020;8(4):838–45.
10. Chong SL, Goh MSL, Ong GYK, Acworth J, Sultana R, Yao SHW, et al. Do paediatric early warning systems reduce mortality and critical deterioration events among children? A systematic review and meta-analysis. Resusc Plus [Internet]. 2022;11(June):100262. Available from: https://doi.org/10.1016/j.resplu.2022.100262
11. Egdell P, Finlay L, Pedley DK. The PAWS score: Validation of an early warning scoring system for the initial assessment of children in the emergency department. Emerg Med J. 2008 Nov;25(11):745–9.
12. Chaiyakulsil C, Pandee U. Validation of pediatric early warning score in pediatric emergency department. Pediatr Int. 2015 Aug 1;57(4):694–8.
13. Agulnik A, Mora Robles LN, Forbes PW, Soberanis Vasquez DJ, Mack R, Antillon-Klussmann F, et al. Improved outcomes after successful implementation of a pediatric early warning system (PEWS) in a resource-limited pediatric oncology hospital. Cancer. 2017 Aug 1;123(15):2965–74.
14. Remtullah AZ, Sirili N, Anaeli A, Massawe A, Manji K, Sunguya BF. Quality of Healthcare in Acute Pediatric Care Unit in a Tertiary Hospital in Tanzania: A Case of Muhimbili National Hospital. Front Pediatr. 2020 Aug 27;8.
15. Ruparellia R. Pattern and Outcome of Patients Admitted At the Paediatric Intensive Care Unit At Muhimbili National Hospital, Dar Es Salaam, Tanzania. 2020;
16. Survey H, Survey I. Tanzania. 2015;
17. PICANet. Summary Report Paediatric Intensive Care Audit Network Annual Report 2018 Organisation key. 2018;(January 2015). Available from: www.picanet.org.uk.
18. Purcell LN, Prin M, Sincavage J, Kadyaudzu C, Phillips MR, Charles A. Outcomes following Intensive Care Unit Admission in a Pediatric Cohort in Malawi. J Trop Pediatr. 2020;66(6):621–9.
19. Alsuheel A, Shati A. Factors predicting mortality in pediatric intensive care unit in a tertiary care center Southwest Region, Saudi Arabia. J Med Med Sci. 2014;5(5):113–20.
20. Rady H. Profile of patients admitted to pediatric intensive care unit, Cairo University Hospital: 1-year study. Ain-Shams J Anaesthesiol. 2014;7(4):500.
21. Agulnik A, Méndez Aceituno A, Mora Robles LN, Forbes PW, Soberanis Vasquez DJ, Mack R, et al. Validation of a pediatric early warning system for hospitalized pediatric oncology patients in a resource-limited setting. Cancer. 2017 Dec 15;123(24):4903–13.
22. Simbila AN, Kilindimo SS, Sawe HR, Kalezi ZE, Yussuf AO, Manji HK, et al. Predictors and outcome of time to presentation among critically ill paediatric patients at Emergency Department of Muhimbili National Hospital, Dar es Salaam, Tanzania. BMC Pediatr [Internet]. 2022;22(1):1–8. Available from: https://doi.org/10.1186/s12887-022-03503-y
23. Numa A, McAweeney J, Williams G, Awad J, Ravindranathan H. Extremes of weight centile are associated with increased risk of mortality in pediatric intensive care. Crit Care [Internet]. 2011;15(2):R106. Available from: http://ccforum.com/content/15/2/R106
24. López-Medina E, Camacho-Moreno G, Brizuela ME, Dávalos DM, Torres JP, Ulloa-Gutierrez R, et al. Factors Associated With Hospitalization or Intensive Care Admission in Children With COVID-19 in Latin America. Front Pediatr. 2022;10(April):1–13.
25. Sawe HR, Mfinanga JA, Lidenge SJ, Mpondo BCT, Msangi S, Lugazia E, et al. Disease patterns and clinical

outcomes of patients admitted in intensive care units of tertiary referral hospitals of Tanzania. BMC Int Health Hum Rights. 2014;14(1):1–8.
26. Pat PLI, Kane SD, Llp F. Page 1 of 27 801. 2006;617(March):1–27.
27. Rusmawatiningtyas D, Rahmawati A, Makrufardi F, Mardhiah N, Murni IK, Uiterwaal CSPM, et al. Factors associated with mortality of pediatric sepsis patients at the pediatric intensive care unit in a low-resource setting. BMC Pediatr [Internet]. 2021;21(1):1–10. Available from: https://doi.org/10.1186/s12887-021-02945-0
28. Alisamir M, Mirkarimi M, Mirzaee S, Heidari S, Barouti S, Mohammadi S. Characteristics and Outcomes of Patients Admitted to a Pediatric Intensive Care Unit in Southwest of Iran. Acta Med Iran. 2022;60(10):646–54.
29. Schleien CL. The Pediatric Intensive Care Unit Business Model. Pediatr Clin North Am. 2013;60(3):593–604.
30. Prince NJ, Brown KL, Mebrahtu TF, Parslow RC, Peters MJ. Weight-for-age distribution and case-mix adjusted outcomes of 14,307 paediatric intensive care admissions. Intensive Care Med. 2014;40(8):1132–9.

****