The use of a special clinical score and platelet count for assessment of severity and outcome of children with acute lower respiratory tract infection

Alaa M. Ali, Ahmed G. Askar, Osama M. Al-Asheer

Department of Pediatrics, Faculty of Medicine, Assiut University, Assiut, Egypt

Correspondence to Alaa M. Ali, Department of Pediatrics, Faculty of Medicine, Assiut University, Assiut 61655, Egypt.
Fax: 088-2332278 - 2080278;
Tel: +20 102 280 9718;
e-mail: 3la2.m7md.3li@gmail.com

Received 17 July 2019
Revised 24 July 2019
Accepted 13 January 2020
Published 11 June 2021

Journal of Current Medical Research and Practice
2021, 6:166–173

Introduction
Lower respiratory tract infections (LRTIs) are a major threat to the health of children worldwide and are exacerbated by global environmental problems. In the developing countries where nutrition remains poor, LRTIs are the most common cause of death in children. However, although the incidence of LRTI in developed countries is as low as 3–4%, its incidence in developing countries ranges between 20 and 30%. Up to 13% of in-patient deaths in pediatric wards are due to LRTI.

Patients and methods
This is a prospective study conducted in Assiut University Children Hospital during the period from November 2017 to February 2018. A total of 100 infants and children aged 1 month to 2 years old were included in the study. The patients were classified into two categories: severe pneumonia and very severe pneumonia or very severe disease according to the presence or absence of general danger signs reported by WHO 2014. All cases were subjected to Temperature, Oxygen saturation, Pulse rate, Respiratory rate, Sensorium loss and Seizures (TOPRS) clinical score, platelet count, and chest radiography.

Results
Overall, 69% of cases were males and 31% of cases were females; 49% of cases were aged 1–6 months, 31% of cases were aged 6–12 months, and 20% of cases were aged 12–24 months; and 73% of cases were discharged, whereas 27% of cases died in the hospital.

Conclusion
A special clinical scoring system called TOPRS score is developed. It is a simple clinical scoring system that depends on physical variables only (temperature, oxygen saturation, pulse rate, respiratory rate, sensorium, and seizures), and it can be used mainly to improve the triage in the emergency room to detect the severity of cases presented and to initiate appropriate emergency treatment in time. It is also helpful to predict outcome of the selected cases. Thrombocytopenia is a good indicator for poor outcome of cases of LRTI, being more powerful than thrombocytosis.

Keywords:
lower respiratory tract infections, platelet count, TOPRS score, WHO

J Curr Med Res Pract 6:166–173

2357-0121

Introduction

Lower respiratory tract infection (LRTI) continues to threaten the health of children worldwide and is exacerbated by global environmental problems. In the developing world where nutrition remains poor and access to healthcare is scarce, LRTIs are the most common cause of illness and death in children. LRTI continues to threaten the countries, and the overall morbidity of LRTI is still high. Although the incidence of LRTI in developed countries may be as low as 3–4%, its incidence in developing countries range between 20 and 30%. In India, in the states and districts with high infant and child mortality rates, LRTI is one of the major causes of death. Up to 13% of in-patient deaths in pediatric wards are due to LRTI [1].

Pneumonia kills more children than any other illness more than AIDS, malaria, and measles combined. More than 2 million children die from pneumonia each year, accounting for almost 1 in 5 under-5 years age deaths worldwide. Yet, little attention is paid to this disease. Only ~1 in 5 caregivers knows the danger signs of pneumonia; only approximately half of children sick with pneumonia receive appropriate medical care, and according to the limited data available, less than 20% of children with pneumonia received antibiotics and the recommended treatment. Effective interventions to reduce pneumonia deaths are available, but reach too few children. Scaling up treatment coverage is possible, and at relatively low cost. Estimates suggest that if antibiotic treatment was universally delivered

to children with pneumonia, ~600 000 lives could be saved each year, at a cost of $600 million [2].

Simple signs were identified to classify varying severities of pneumonia in settings with little or no access to diagnostic technology; the classifications determined the appropriate case management actions. Children with fast breathing were classified as having 'pneumonia' and were given an oral antibiotic (at that time oral cotrimoxazole) to take at home for 5 days. Children who had chest indrawing with or without fast breathing were classified as having 'severe pneumonia' and were referred to the closest higher level health facility for treatment with injectable penicillin. Children who had any general danger signs as not able to drink, persistent vomiting, convulsion, lethargic or unconscious, stridor in a calm child, and severe malnutrition were classified as having 'severe pneumonia or very severe disease.' These children received a first dose of oral antibiotic and were then urgently referred to a higher-level health facility for further evaluation and treatment with parenteral antibiotics. Hence, in a programmatic context, the distinction between previously defined 'pneumonia' (fast breathing) and 'severe pneumonia' (chest indrawing) loses its significance. The new classification is therefore simplified to include only two categories of pneumonia; 'pneumonia' with fast breathing and/or chest indrawing, which requires home therapy with oral amoxicillin, and 'severe pneumonia,' pneumonia with any general danger sign, which requires referral and injectable therapy [3].

Identification and triage of seriously ill patients visiting emergency department is very important for prioritization of care and answering parent's queries about outcome, hospital stay, and cost of treatment, especially in developing countries. Early recognition of serious illness might reduce the morbidity and mortality in sick patients. Most of the existing scoring systems developed for ICU patients and neonates are not executed at admission; hence, these are not useful for triage [4,5].

In this study, a simple scoring system 'TOPRS' has been evolved using only physical variables to predict severity of illness and outcome in emergency department. Six clinical variables were noted at the time of admission of patients to emergency department. These included temperature, oxygen saturation, pulse rate, respiratory rate, sensorium, and seizures. Axillary temperature was measured using a mercury thermometer. Oxygen saturation was measured using a pulse oximeter. Pulse rate and respiratory rate were counted clinically. Sensorium level was measured by modified Glasgow coma scale for infants and children, and seizures was observed.

The importance of platelets in the host immune response is increasingly recognized [6], which has until recently been considered a normal inflammatory response to infections. Thrombocytosis is associated with respiratory complications of community-acquired pneumonia (pleural effusion and empyema) and poorer outcomes [7]. Moreover, thrombocytopenia is recognized as a marker of poor outcomes in patients with pneumonia, owing to the association of low platelet counts with disseminated intravascular coagulation and severe sepsis. In conclusion, on assessment of patients with community-acquired pneumonia at admission, platelet count could be considered to be a valuable indicator of severity and outcome on evaluating hemogram (complete blood count) values than the more commonly used leukocyte count. Platelet count may be used as a useful marker associated with severity of LRTI and its complications [8].

Aim

The following were the aims of the study:

(1) Assessment of 'TOPRS' clinical scoring system in determination of severity of LRTI according to WHO (2014) revised classification and treatment of childhood pneumonia.
(2) Detect any association between platelet count at time of hospitalization and the severity of infection according to recent WHO (2014) revised classification and treatment of childhood pneumonia.

Patients and methods

This is a prospective study conducted in Assiut University Children Hospital during the period from November 2017 to February 2018. A total of 100 infants and children aged 1 month to 2 years old were included in our study. Our patients were classified into two categories, severe pneumonia and very severe disease, according to the presence or absence of general danger signs reported by WHO 2014.

Inclusion criteria

The following were the inclusion criteria:
(1) Infants and children aged 1 month to 2 years old.
(2) Admitted to Assiut University Children Hospital.
(3) Cough and tachypnea or bradypnea.
(4) Lower chest indrawing.

Exclusion criteria

The following were the inclusion criteria:

(1) Tuberculosis.
(2) Cardiac disease.
(3) Possible presence of an intrathoracic foreign body.
(4) Asthma exacerbation.

Methodology

All cases were subjected to the following:

(1) Full history taking.
(2) Clinical examination including general and local examination.
(3) Complications and outcome were recorded.
(4) TOPRS clinical score was applied to all cases at the time of admission.

Investigations

(1) Chest radiography at the time of admission.
(2) Complete blood count including the platelet counts at the time of admission then every week for follow-up.

Grouping

Cases were classified into two groups:

(1) Severe pneumonia if the case presented with cough, fast breathing, and chest indrawing.
(2) Very severe pneumonia or very severe disease if the case presented with the previous manifestations in addition to general danger signs of WHO 2014 which are unable to drink, persistent vomiting, convulsion, lethargy, stridor in a calm child, and severe malnutrition.

Scoring

(1) WHO score was applied to all studied cases. Presence of general danger signs, indicating very severe disease, and absence of these manifestations, indicating severe pneumonia.
(2) TOPRS clinical score was applied to all studied cases. Score 1 was given for each of the following parameters:
    (a) Temperature greater than 38 or less than 36°C measured axillary by mercury thermometer.
    (b) Oxygen saturation less than 90% measured by pulse oximeter.
    (c) Pulse rate greater than 160/min in infants and greater than 150/min measured clinically.
    (d) Respiratory rate greater than 60/min in infants and greater than 50/min in measured clinically.
    (e) Loss of sensorium by Glasgow coma scale.
    (f) Presence of seizures.

Statistical analysis

(a) Continuous data were presented with mean ± SD (range) and categorical data were expressed as frequency.
(b) χ^2 was used to compare frequencies among different categories.
(c) Student's *t*-test and analysis of variance were used to test differences between means.
(d) All statistical analyses were performed using Statistical Package for Social Sciences Software, vesion 20 (SPSS ver 20 software IBM Inc., Chicago, Illionois, USA).
(e) *P* value less than 0.05 was considered statistically significant for all applied statistical tests.

Ethical considerations

(a) Approval of the study from the Ethics Committee of Faculty of Medicine, Assiut University, was obtained.
(b) A written informed consent was taken from the participant's caregivers.

Results

The data showed that 69% of cases were males and 31% of cases were females (Fig. 1, 2).

The data showed that 49% of cases were aged 1–6 months, 31% of cases were aged 6–12 months, and 20% of cases were aged 12–24 months (Fig. 3).

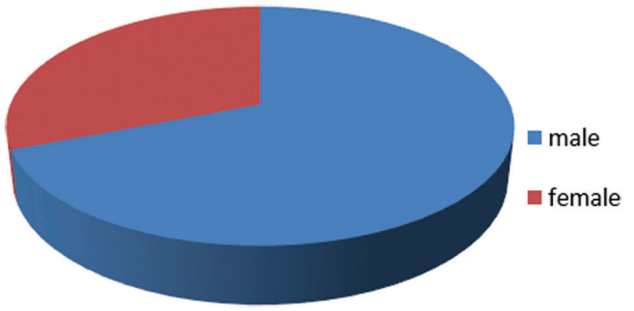
The data showed that 73% of cases were discharged and 27% of cases died in the hospital (Fig. 4).

According to presence or absence of general danger signs of WHO criteria, patients were classified into severe pneumonia (9%) and very severe disease (91%) (Fig. 5).

The data showed the following:

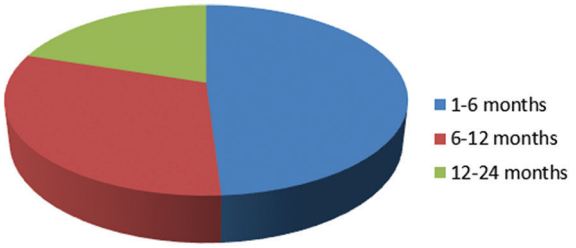
(1) All 100 cases were subjected to TOPRS clinical scoring system, showing that score 3 was the most common presentation, with ~50% of whole cases, followed by score 2 with 23%, score 4 with 15%, score 5 with 7%, score 6 with 5%, and then score 1 with 0%, which means that no one of the studied cases was presented with only one of TOPRS clinical score.
(2) Highest mortality rate was shown with cases presented with score 6, with 100% of cases died, followed by score 5, with 42.9% died, score 4 with 33.3% then score 3 with 20%, and score 2 with 17.4%. Mortality was directly related to the frequency of presentations with special orientation toward the increase in TOPRS score (Table 1).

Figure 1



Sex distribution among the studied cases.

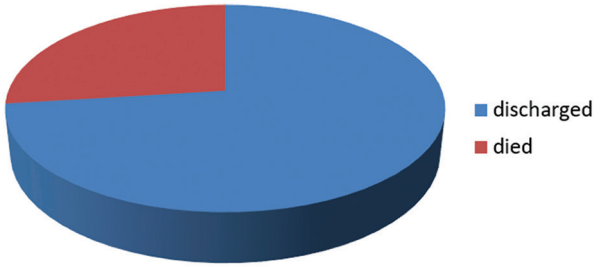
Figure 2



The data showed that 49% of cases were aged 1-6 months, 31% of cases were aged 6-12 months and 20% of cases were aged 12-24 months.

Age distribution among the studied cases.

Figure 3



The data showed that 73% of cases were discharged and 27% of cases died in the hospital.

Outcome of the selected cases.

The data showed the following:

(1) No case was presented with temperature less than 38°C.
(2) All cases presented with seizures died in the hospital.
(3) Cases presented with no tachypnea either presented with apnea or bradypnea.
(4) There was a significant relationship between outcome of the selected cases and three variables of TOPRS clinical score: oxygen saturation less than 90%, tachypnea for age, and presence of seizures, correspondingly (Table 2).

Table 1 Different variables of TOPRS clinical score in association with outcome

	Temperature >38 [*n* (%)]		
	No (*n*=42)	Yes (*n*=58)	*P*
Outcome			
Discharged	30 (71.4)	46 (79.3)	0.551
Died	12 (28.6)	12 (20.7)	
	O_2 saturation<90		
	No (*n*=76)	Yes (*n*=24)	
Outcome			
Discharged	63 (82.9)	13 (54.2)	0.012*
Died	13 (17.1)	11 (45.8)	
	HR (tachycardia for age)		*P*
	No (*n*=13)	Yes (*n*=87)	
Outcome			
Discharged	7 (53.8)	69 (79.3)	0.114
Died	6 (46.2)	18 (20.7)	
	RR (tachypnea for age)		*P*
	No (*n*=6)	Yes (*n*=94)	
Outcome			
Discharged	2 (33.3)	74 (78.8)	0.040*
Died	4 (66.7)	20 (21.3)	
	Sensorium (loss) GCS <15		*P*
	No (*n*=72)	Yes (*n*=28)	
Outcome			
Discharged	56 (77.8)	20 (71.4)	0.388
Died	16 (22.2)	8 (28.6)	
	Seizures		*P*
	No (*n*=96)	Yes (*n*=4)	
Outcome			
Discharged	76 (79.2)	0 (0.0)	0.001*
Died	20 (20.8)	4 (100.0)	

GCS, Glasgow coma scale.

Table 2 Outcome of different scores

Scores	Discharged [*n* (%)]	Died [*n* (%)]	Total
1	0	0	0
2	19 (82.61)	4 (17.39)	23
3	40 (80)	10 (20)	50
4	10 (66.66)	5 (33.33)	15
5	4 (57.14)	3 (42.86)	7
6	0	5 (100)	5

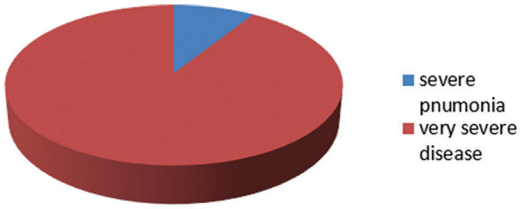
The data showed the following:

(1) Highest mortality rate was detected in score 6 with 100% of cases.
(2) No case in our study presented with score 1.
(3) Score 3 showed the most common presentation with 50% of cases followed by score 2, 4, 5, and then 6 (Table 3).

The data showed the following:

(1) Nasal flaring was the most noticed sign according to WHO criteria for severe pneumonia followed by fast breathing, then chest indrawing, then cough, and then the inability to drink.
(2) Overall, 4% of cases presented with convulsions at admission, and all of them died in the hospital.

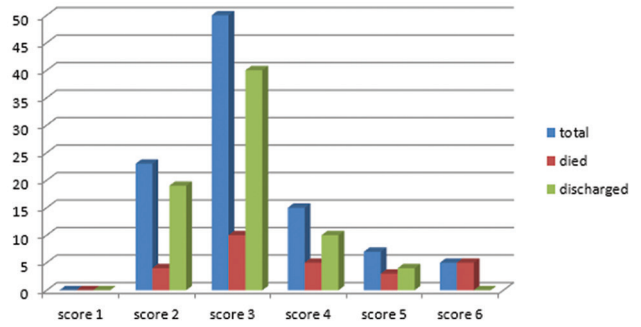
Figure 4



According to presence or absence of general danger signs of WHO criteria patients were classified into severe pneumonia 9% and very severe disease 91%.

Classification of cases according to WHO criteria.

Figure 5



Classification of cases according to TOPRS clinical score and its relation to outcome.

Table 3 Outcome of the selected cases in relation to WHO criteria and general danger signs of severe pneumonia

	Children who discharged in the hospital [*n* (%)]	Children who died in the hospital [*n* (%)]	Total	*P*
Cough				
No	21 (80.8)	5 (19.2)	26	0.300
Yes	52 (70.3)	22 (29.7)	74	
Fast breathing				
No	2 (33.3)	4 (66.7)	6	0.040
Yes	67 (71.3)	27 (28.7)	94	
Nasal flaring				
No	0	3 (100)	3	0.004*
Yes	73 (75.3)	24 (24.7)	97	
Chest indrawing				
No	6 (40)	9 (60)	15	0.002*
Yes	67 (78.8)	18 (21.2)	85	
Cyanosis				
No	57 (71.2)	23 (28.8)	80	0.430
Yes	16 (80)	4 (20)	20	
Not able to drink				
No	14 (50)	14 (50)	28	0.329
Yes	59 (81.9)	13 (18.1)	72	
Lethargic				
No	42 (73.7)	15 (26.3)	57	0.859
Yes	31 (72.1)	12 (27.9)	43	
Convulsions				
No	73 (76)	23 (24)	96	0.001*
Yes	0	4 (100)	4	
Severe malnutrition				
No	66 (78.6)	18 (21.4)	84	0.690
Yes	7 (43.8)	9 (56.2)	16	

(3) There was a significant relationship between outcome and some of WHO criteria (nasal flaring, chest indrawing, and convulsions).
(4) In spite of insignificant statistical relationship between outcome and severe malnutrition, 56.2% of cases presented with severe malnutrition died in the hospital.
(5) In spite of insignificant relationship between outcome and lethargy, 27.3% of cases presented with lethargy died in the hospital (Table 4).

The data showed the following:
(1) Overall, 15.6% of cases with thrombocytosis at admission had empyema as a complication, 12.5% had septic shock, 12.5% had Disseminated intravascular coagulation (DIC), and 25% had respiratory failure.
(2) Moreover, 75% of cases with thrombocytosis at admission were admitted for 6–10 days, 25% admitted for more than 10 days, whereas 0 cases stayed for 3–5 days, which indicates increasing period of hospitalization in those who had thrombocytosis.
(3) In addition, 75% of cases with thrombocytosis at admission were discharged, whereas 25% of cases died in hospital.
(4) There is no significant relationship between thrombocytosis and different complications occurred in the selected cases.
(5) There is a strong statistical relationship between thrombocytosis and duration of hospitalization, but no significant relationship to the outcome of the selected cases (Table 5).

The data showed the following:
(1) Overall, 100% of cases that had thrombocytopenia at admission had septic shock, 100% had DIC, 0% had empyema, 0% had secondary thrombocytosis, and 100% had respiratory failure.
(2) Moreover, 66.7% of cases with thrombocytopenia stayed for 3–5 days at hospital, 33.3% of cases with thrombocytopenia stayed for 6–10 days and 0% cases stayed for more than 10 days which indicate decreasing period of hospitalization for those who had thrombocytopenia, and this may be owing to high death rate that shortens the hospital stay.
(3) In addition, 100% of all cases having thrombocytopenia at admission were died at hospital.
(4) There is a strong statistical relationship between thrombocytopenia and most of complications occurred in the selected cases except for empyema.
(5) There is a strong relationship with duration of hospitalization and outcome of the selected cases.

Table 4 Thrombocytosis in relation to respiratory complications occurring in the selected cases of our study, duration of hospitalization and outcome

	Thrombocytosis [*n* (%)]		
	No (*n*=68)	Yes (*n*=32)	*P*
Empyema			
No	64 (94.1)	27 (84.4)	0.255
Yes	4 (5.9)	5 (15.6)	
Septic shock			
No	49 (72.1)	28 (87.5)	0.087
Yes	19 (27.9)	4 (12.5)	
DIC			
No	49 (72.1)	28 (87.5)	0.087
Yes	19 (27.9)	4 (12.5)	
Respiratory failure			
No	48 (70.6)	24 (75.0)	0.647
Yes	20 (29.4)	8 (25.0)	
Duration of hospitalization (days)			
3-5	24 (35.3)	0	<0.001**
6-10	40 (58.8)	24 (75.0)	
>10	4 (5.9)	8 (25.0)	
Outcome			
Discharged	49 (72.1)	24 (75.0)	0.757
Died	19 (27.9)	8 (25.0)	

DIC, Disseminated intravascular coagulation.

Table 5 Thrombocytopenia in relation to respiratory complications occurring in the selected cases of our study, duration of hospitalization and outcome

	Thrombocytopenia [*n* (%)]		
	No (*n*=88)	Yes (*n*=12)	*P*
Empyema			
No	80 (90.9)	12 (100)	0.276
Yes	8 (9.1)	0	
Septic shock			
No	80 (90.9)	0	<0.001**
Yes	8 (9.1)	12 (100)	
DIC			
No	80 (90.9)	0	<0.001**
Yes	8 (9.1)	12 (100)	
Respiratory failure			
No	72 (81.8)	0	<0.001**
Yes	16 (18.2)	12 (100)	
Duration of hospitalization (days)			
3-5	16 (18.2)	8 (66.7)	<0.001**
6-10	60 (68.2)	4 (33.3)	
>10	12 (13.6)	0 (0)	
Outcome			
Discharged	73 (83.0)	0	<0.001**
Died	15 (17.0)	12 (100.0)	

*Means moderately significant, ** means highly significant.

Discussion

In this study, 69% of cases were males, whereas 31% were females, and this agrees with previous studies done by Sreenivasa *et al*., Bains and Soni, and also by Naheed *et al*. [5,9,10]. This can be explained with that the X chromosome is known to contain the largest number of immune-related genes of the whole human genome [11], so sex-based differences in immune responses affect both the innate and adaptive immune responses [12].

Our study showed that 80% of cases were in the first year of life from 1 to 12 months, and this agrees with these studies done by Sreenivasa *et al*. and Naheed *et al*. [9,10], who reported that most of their studied cases were in the first year of life, with percentages of 70 and 69.7% respectively, whereas those presented after the first year of life were 30 and 30.3%, respectively. This can be explained with the rapid deterioration of cases in first year of life and lack of both adaptive and innate immunity in infants.

Overall, 73% of our studied cases were discharged, whereas 27% died in hospital. This ratio is considered to be high if compared with ratios in the study by Bains and Soni[5] and also by another study done by Naheed *et al*. [9]. This high rate of mortality recorded in our study may be owing to that the study is conducted in a tertiary center where there is delayed presentation or after previous trials of treatment in primary and secondary health care units. This may be the direct cause of high mortality ratio.

In this study, 67% of cases who died in hospital by pneumonia were infants (1–12 months), whereas the rest of cases were more than 12 months, which agreed with a similar study done by Naheed *et al*.[9] and by Rudan *et al*. [13]. This can be explained by several factors influencing this age group, particularly as immature innate and adaptive immunity, which increases infant susceptibility to pneumonia compared with older children and adults. Moreover, low birth weight, prematurity, and being mechanically ventilated before increases the risk of pneumonia in infancy [14].

The average duration of hospitalization to the cases of pneumonia in our study was 6–10 days, which agreed with the study by Mirsaeidi *et al*.[6] and Naheed *et al*. [9].

The data in our study showed a significant relationship between outcome, chest indrawing, and convulsions. This agrees with another study that supports these recommendations, by Agweyu *et al*. [15].

On the contrary, our study revealed that outcome was not related to lethargy or inability to drink or breast-feed, which was not in agreement with that mentioned in the study by Naheed [9], where there was a significant relationship between outcome and inability to drink, convulsions, lethargy, and severe malnutrition.

There was a significant relationship between outcome of the selected cases and TOPRS clinical score. Oxygen saturation less than 90%, tachypnea for age, and presence of seizures were detected to have

a strong association with poor outcome. This agreed with the study by Bains and Soni[5] but with different parameters. They found a significant relationship between outcome and three variables of TOPRS score: temperature, oxygen saturation less than 90, and tachypnea for age. They recorded that TOPRS score is not only strongly related to outcome of cases with pneumonia but also very beneficial in triage of patients in emergency room, so it is very important to apply TOPRS score for all cases presented in ER for rapid management of emergency cases that need urgent intervention, which was recommended also by other studies, such as Yeh *et al*.[16] and Shann *et al*. [17].

In this study, cases that presented with score 6 showed the highest mortality ratio, with 100% of the cases, followed by score 5 with 42.86%, score 4 with 33.33%, score 3 with 20%, and then score 2, which showed the lowest mortality ratio with 17.39%. This agreed with similar studies regarding such an issue by Bains and Soni[5] and Gupta *et al*. [18].

Thrombocytosis was recorded to have significant relationship with duration of hospitalization. The data showed that cases that had thrombocytosis had longer duration of hospitalization. This agreed with other studies by Sreenivasa *et al*. [10], Prina *et al*. [7], and Mirsaeidi *et al*. [6]. In contrast to the aforementioned findings, a study in 1990 by Wolach *et al*.[19] showed no associations of thrombocytosis with increased duration of hospital stay.

There was no significant relationship between thrombocytosis and outcome of the selected cases, which was recommended in Sreenivasa *et al*.[10] study but not in agreement with another studies done by Mirsaeidi *et al*.[6] and Wolach *et al*. [19].

A strong and significant relationship was detected between thrombocytopenia and different complications occurred in the selected cases. Moreover, there was a significant relationship between thrombocytopenia and duration of hospitalization and outcome of the selected cases, and this agreed with the recommendations of ElMaraghy *et al*. [20], and Mirsaeidi *et al*. [6].

Overall, 44.4% of cases that died in the hospital owing to pneumonia had thrombocytopenia, representing 12% of all cases. All had septic shock, DIC, and respiratory failure, indicating a strong and significant relationship between thrombocytopenia and respiratory failure, ICU admission, and being died in hospital. This agrees with the study by Rahimi-Rad *et al*. [21].

Conclusion

(1) TOPRS scoring system is a simple clinical scoring system that depends on physical variables only, and it can be used mainly to improve the triage in the emergency room to detect the severity of cases presented and to initiate appropriate emergency treatment in time. It is also helpful to predict outcome of the selected cases.
(2) Thrombocytopenia is a good indicator of poor outcome of cases of LRTIs and is more powerful than thrombocytosis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Park K. Park's textbook of preventive and social medicine. In: Park K, editors. *A Book*. 22nd ed. Jabalpur, India: BanasidasBhanot; 2013.
2 Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? Lancet 2003; 362:65–71.
3 Integrated Management of Childhood Illness (IMCI) (revised). Revised WHO classification and treatment of childhood pneumonia at health facilities, evidence summaries, 2014. Geneva: World Health Organization/ The United Nation Children's Fund (UNICEF); 2014. Available from: http://www.who.int/maternal_child_adolescent/documents/IMCI_chartbooklet/en/). [Last accessed on 2019 May 21].
4 Kadivar M, Sagheb S, Bavafa F, Moghadam L, Eshrati B. Neonatal mortality risk assessment in a neonatal intensive care unit (NICU). Iran J Pediatr 2007; 17:325–331.
5 Bains S, Soni K. Department of Pediatrics and Community Medicine, Dayanand Medical College and Hospital, Ludhiana, India. TOPRS to Predict Outcome in Pediatric Emergency Department. J Pediatr 2012; 22:97–101.
6 Mirsaeidi M, Peyrani P, Aliberti S, Filardo G, Bordon J, Blasi F, *et al*. Thrombocytopenia and thrombocytosis at time of hospitalization predict mortality in patients with community-acquired pneumonia. Chest 2010; 137:416–420.
7 Prina E, Ferrer M, Ranzani OT, Polverino E, Cillóniz C, Moreno E, *et al*. Thrombocytosis is a marker of poor outcome in community-acquired pneumonia. 2013; 143:767–775.
8 Shaaban LH, Ahmed Y. Hemogram values in community acquiredpneumonia. Egypt J Chest Dis Tubercul 2015; 64:617–623.
9 Naheed A, Saha SK, Breiman RF, Khatun F, Brooks WA, El Arifeen S, *et al*. Multihospital surveillance of pneumonia burden among children aged <5 years hospitalized for pneumonia in Bangladesh. Clin Infect Dis 2009; 48:S82–S89.
10 Sreenivasa B, Kumar GV, Manjunatha B. Study of significance of thrombocytosis in lower respiratory tract infections in children. Int J Contemporary Pediatr 2015; 2:103–107.
11 Bianchi I, ALleo M, Gershwin E, Invernizzi P. The X chromosome and immune associated genes. J Autoimmun 2012; 38:J187eJ192.
12 Pennell LM, Galligan CL, Fish EN. Sex affects immunity. J Autoimmun 2012; 38:J282eJ291.
13 Rudan I, Tomaskovic L, Boschi-Pinto C, Campbell H. on behalf of the Child Health Epidemiology Reference Group. Global estimates of the incidence of clinical pneumonia among children under five years of age. Bull World Health Organization 2004; 82:895–903.
14 Hooven TA, Polin RA. Semin Fetal Neonatal Med. 2017; 22:206–213. doi: 10.1016/j.siny.2017.03.002. Epub 2017 Mar 24.
15 Agweyu A, Lilford RJ, English M. Appropriateness of clinical severity classification of newWHO childhood pneumonia guidance: a multi-hospital,

retrospective, cohort study. Lancet Glob Healt 2018; 6:e74–e83.

16 Yeh TS, Pollack MM, Ruttimann UE, Holbrook PR. Validation of a Physiologic Stability Index for usein critically iII infants and children. Pediatric Res 1984; 18:445–451.

17 Shann E, Pearson G, Slater A, Wilkinson K. Pediatric index of mortality (PIM): a mortalityprediction model for children in intensive care. Intensive Care Med 1997; 23:201–207.

18 Gupta MA, Chakrabarty A, Halstead R, Sahni M, Rangasami J, Puliyel A, *et al*. Validation of 'Signs of inflammation in children that kill' (SICK) score for immediate non invasive assessment of severity of illness. Italian J Pediatr 2010; 36:35.

19 Wolach B, Morag H, Drucker M, Sadan N. Thrombocytosisafter pneumonia with empyema and other bacterial infectionsin children. Pediatr Infect Dis J 1990; 9:718–721.

20 ElMaraghy AA, AbdelFattah EB, Ahmed MS. Platelet count: is it a possible marker for severity and outcome of community acquired pneumonia? Egypt Soc Chest Dis Tubercul 2015; 65:499–504.

21 Rahimi-Rad M, Soltani S, Rabieepour M, Rahimirad S. Thrombocytopenia as a marker of outcome in patients with acute exacerbation of chronic obstructive pulmonary disease. Pneumonol Alergol Pol 2015; 83:348–351.