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A STUDY USING 'SIGNS OF INFLAMMATION IN CHILDREN THAT CAN KILL (SICK)' SCORE TO ASSESS THE CLINICAL OUTCOME OF CHILDREN ADMITTED TO THE PAEDIATRIC UNIT

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Introduction

From very olden times, scoring systems have been developed to assess the severity and outcome of illnesses. In Paediatrics, scoring systems like Therapeutic Intervention Scoring System(TISS), Paediatric risk of mortality (PRISM) score, Paediatric index of mortality (PIM), Paediatric Sequential Organ Failure Assessment (pSOFA) have been developed to assess the severity of organ damage and outcome of critically ill patients. But this scoring system are dependent on laboratory results and hence is cost consuming, labor intensive and requires prolonged observation. It also takes time for the lab results to come and initiate further management. In such situations, a good scoring system based on physical variables will help in appropriate triaging of the patient at admission, to initiate effective steps in the management of the patient and avoid harmful delays.

The word "Triage" means to sort. In many situations, children have died of a treatable condition after waiting in the queue for long duration for their turn. This can be circumvent by triaging the patients. Scoring systems to identify a sickchild and to assess the severity of illness have been developed and used in Paediatric intensive care units (PICU). These scoring systems help in prediction of mortality and also give scope for comparison of standard of care in various PICU. In adults, disease specific early warning scores have been developed to identify sick patient[1]. But not much scores so in children. By quantitating the degree of derangement in 34 variables from 7 major physiologic systems, Physiological Stability Index(PSI) score can assess the severity of acute illness of children admitted to paediatric intensive care. The most deranged value of a variable recorded within 24 hours was used. The individual scores asserted on the clinical importance of abnormality of score, but not on the degree of deviation from the normal value[2]. The other scoring system Paediatric Risk of Mortality (PRISM) which came as a simplification of PSI, reduced the number of variables to be assessed to 14. But PRISM uses laboratory values. So the score is not assessable on presentation. This was overcome by Paediatric index of Mortality (PIM) score as it is calculated directly on admission to PICU within 1 hour. Emergency Triage, assessment and treatment (ETAT) guidelines developed by World Health Organization (WHO) classify children into three categories: with emergency signs, with priority signs, non-urgent cases. But the drawback is that application of ETAT requires specific training program before putting into practice[3].

The 'SICK' score was developed based on the physical variables of Systemic Inflammatory Response Syndrome (SIRS) and Multiple Organ Dysfunction Syndrome (MODS). The 'Signs of inflammation in children that can kill (SICK)' score evaluates the expected risk of mortality in children. It can be used as a practical tool in prediction of severity of sickness and mortality in the paediatric emergency. In this study, I intend to evaluate the utility of 'SICK' score in triaging patients admitted to the paediatric unit.

Objectives

PRIMARY OBJECTIVE

a) To assess the usefulness of 'SICK' score in predicting the outcome of patients admitted to the pediatric unit

SECONDARY OBJECTIVE

a) To assess the correlation between outcome and individual physical parameters in 'SICK' score
c) To assess the correlation between 'SICK' score and duration of stay in the hospital

METHODOLOGY

a) **STUDY DESIGN:** Prospective observational study
b) **STUDY PERIOD:** January 2018 to June 2019
c) **STUDY SETTING:**

Pediatric patients aged 1 month to 12 years admitted to the paediatric unit in Jubilee Mission Medical College hospital, Thrissur was recruited for the study

d) **SAMPLING:**
1) **Sample size**:

Based on the sensitivity of 57.1% observed in an earlier publication: Validation of 'Signs of inflammation in children that can kill' (SICK) Score for noninvasive assessment of

severity of illness [4], with 99% confidence level and 5% relative allowable error

Sample size (n) based on sensitivity

$$= \frac{Z^2 1 - \alpha/2 \times S_N \times (1 - S_N)}{L^2}$$

$Z_{1-\alpha/2}$ for a confidence level 99 % is 2.58

S_N = sensitivity = 57.1%

L = Margin of error = 5%

Precision = 95 %

Thus the minimum sample size for the study is 652.

2) Inclusion Criteria: All patients in the age group of 1month to 12yrs of age admitted to the paediatric unit would be enrolled in the study

3) Exclusion Criteria:

a) Children admitted with congenital anomalies
b) Children admitted with surgical problems
c) Those discharged against medical advice
d) Children whose parents who were not willing to sign the consent form to take part in study

4) Methods:

Methods of data collection:

All children satisfying the inclusion and exclusion criteria were recruited in the study. An informed and written consent was obtained from the parents / legal guardian in a language clearly understood by them, before the child was subjected to examination.

Age, gender, relevant history, general physical examination and systemic examination findings at the time of admission were filled up in the proforma.

Physical variables like sensorium (AVPU scale), heart rate, respiratory rate, blood pressure (manual), capillary refill time, temperature, oxygen saturation (pulse oximetry) were recorded in the proforma at the time of admission. It was scored according to 'SICK' scoring system. Sensorium or consciousness level was assessed using AVPU score (alert, responsive to voice, responsive to pain, unresponsive). Heart rate was recorded by auscultatory method for a time frame of 1 min. Respiratory rate was measured by observing the child for a time frame of 1 min. Blood pressure was recorded with a standard mercury sphygmomanometer of the appropriate cuff size. The cuff bladder was wide enough to cover at least $2/3^{rd}$ of arm and long enough to encircle arm completely. Capillary refill time was found out by raising the lower limb slightly above the heart level and pressure was applied over the great toe for 5s and then time taken for refill was count. Temperature was recorded in unilateral axilla using thermometer in Fahrenheit scale. Each of the physical variable were taken as binomial variables, classified as normal or abnormal and marked in the proforma. Weightage for each physical variable was taken into account and total 'SICK' score was calculated.

Table 1: 'SICK' SCORE PARAMETERS [5]

Vital sign	Abnormal parameters	Normal	Abnormal
Sensorium level (AVPU score)	Responsive to voice Responsive to pain Unresponsive		
Heart rate	>160 (<1 year) >150 (>1 year)		
Respiratory rate	> 60 for < 2 months > 50 for 2 – 12 months > 40 for 1 – 5 years > 30 for 6 – 12 years Any gasping respiration		
Temperature	> 100.4^0 F < 96.8^0 F		
Blood pressure (systolic)	< 70 mm of Hg(1 month to 1year) < (age)2 + 70(1 - 10 years) <90 mm of Hg(>10 years)		
Capillary refill time	≥ 3s		
Saturation (pulse ximetry)	< 90%		

Table 2: WEIGHTAGE OF INDIVIDUAL PARAMETERS IN 'SICK' SCORE [4]

Variable	Weightage
Heart rate	0.2
Respiratory rate	0.4
Blood pressure(systolic)	1.2
Temperature	1.2
spO_2	1.4
Capillary refill time	1.2
AVPU	2
Age (months)	
60	0
12 to < 60	0.3
1 to < 12	1

The minimum score was 0 and maximum possible sick score was 8.6.The outcome was recorded as survived or expired. The duration of stay in the PICU / ward was also noted.

Statistical Methods:

- ROC curve was applied and then it was assessed with diagnostic test (sensitivity, specificity) to obtain the cut off value of 'SICK' score for predicting mortality.
- Chi – square was applied to obtain the association of study variables with outcome
- Karl Pearson correlation was applied to obtain the correlation between duration of hospital stay and 'SICK' score.

Data obtained from 1651 patients meeting the inclusion criteria were entered into Microsoft Excel sheet and analyzed using SPSS 20. p value less than 0.05 was considered as statistically significant.

Results:

Table 3: Distribution of Age

Age (Years)	Frequency	Percent
Up to 1	500	30.3%
1 – 5	896	54.3%
>5	255	15.4%

In this study, almost 30.3% of the cases belonged to the age group up to 1 year and 54.3% of the cases belong to the group 1-5 years. Around 15.4% cases with age more than 5 years were also noted.

Among 1651 cases taken for the study, around 58.0% of the cases were boys and 42.0% of the cases were girls.

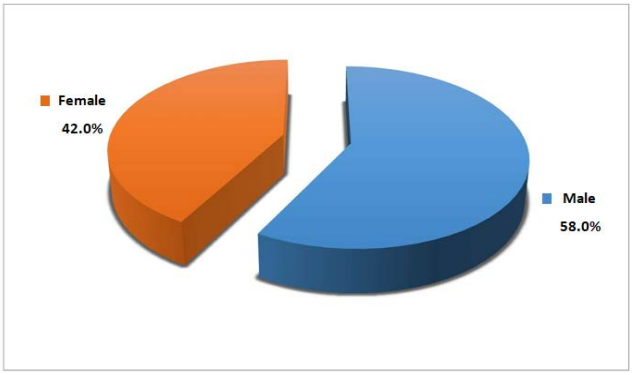

Figure 1: Distribution of Sex Death cases was almost same in male (1.6%) and female (1.4%).

Table 4: Relationship between Outcome and SICK Score

Outcome	Mean	SD	p - value
Death	5.828	1.069	< 0.001
Survived	3.798	1.003	

There was significant relationship between outcome and SICK score. The table revealed that the SICK score was significantly higher in death cases (5.828 ± 1.069) compared to survived cases (3.798 ± 1.003).

Table 5: Comparison of SICK Score with Outcome

SICK Score	Outcome		Total	Sensitivity	Specificity	PPV	NPV	Accuracy
	Death	Survived						
> 4.8	25	243	268	100.0 %	85.1 %	9.3 %	100.0 %	85.3 %
< 4.8	0	1383	1383					
Total	25	1626	1651					

As the relationship between outcome and SICK score was significant, the ROC curve was drawn to find the cut-off value for SICK score to predict the outcome. The cut-off value for SICK score was 4.8 with area under the curve 0.964 (0.948 – 0.981). Using this cut-off, SICK score had predicted 100.0% death cases and 85.1% survived cases. The accuracy suggested that the overall prediction of outcome using SICK score was 85.3%.

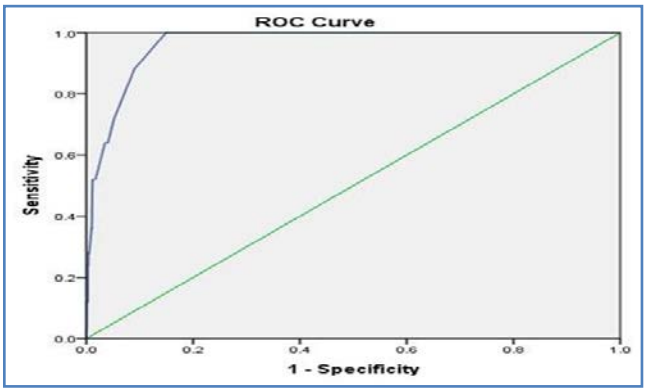

Figure 2: ROC Curve

Table 6: Relationship between Outcome and Age

Age (Years)	Outcome		Total	p - value
	Death	Survived		
Up to 1	7 (3.2%)	209 (96.8%)	216	0.033
1 - 5	11 (1.0%)	1081 (99%)	1092	
>5	7 (2.0%)	336 (98%)	343	
Total	25 (1.5%)	1626 (98.5%)	1651	

There was a significant relationship between outcome and age. The table revealed that the death cases were significantly higher in cases with lower age (3.2%) compared to the cases with age 1-5 years (1.0%) and more than 5 years (2.0%).

Table 7: Relationship between Outcome and Sensorium

Sensorium	Outcome		Total	p - value
	Death	Survived		
Normal	0 (0.0%)	1553 (100.0%)	1553	<0.001
Abnormal	25 (25.5%)	73 (74.5%)	98	
Total	25 (1.5%)	1626 (98.5%)	1651	

There was a significant relationship between outcome and sensorium. The table revealed that the death cases were significantly higher in cases with abnormal sensorium (25.5%) compared to the cases with normal sensorium (0.0%).

Table 8: Relationship between Outcome and Heart Rate

Heart Rate	Outcome		Total	Odds Ratio (95% CI)	p - value
	Death	Survived			
Normal	1 (0.1%)	1159 (99.9%)	1160	58.82 (8.06 - 500)	<0.001
Abnormal	24 (4.9%)	467 (95.1%)	491		
Total	25 (1.5%)	1626 (98.5%)	1651		

There was a significant relationship between outcome and heart rate. The table revealed that the death cases were significantly higher in cases with abnormal heart rate (4.9%) compared to the cases with normal heart rate (0.1%). The odds ratio indicated that the cases with abnormal heart rate had 58.82 times more chance for death than the cases with normal heart rate.

Table 9: Relationship between Outcome and Respiratory Rate

Respiratory Rate	Outcome		Total	Odds Ratio (95% CI)	p - value
	Death	Survived			
Normal	9 (1.0%)	922 (99.0%)	931	2.326 (1.02 - 5.29)	0.038
Abnormal	16 (2.2%)	704 (97.8%)	720		
Total	25 (1.5%)	1626 (98.5%)	1651		

There was a significant relationship between outcome and respiratory rate. The table revealed that the death cases were significantly higher in cases with abnormal respiratory rate (2.2%) compared to the cases with normal respiratory rate (1.0%). The odds ratio indicated that the cases with abnormal respiratory rate had 2.326 times more chance for death than the cases with normal respiratory rate.

Table 10: Relationship between Outcome and Temperature

Temperature	Outcome		Total	p - value
	Death	Survived		
Normal	0 (0.0%)	716 (100.0%)	716	<0.001
Abnormal	25 (2.7%)	910 (97.3%)	935	
Total	25 (1.5%)	1626 (98.5%)	1651	

There was a significant relationship between outcome and temperature. The table revealed that the death cases were significantly higher in cases with abnormal temperature (2.7%) compared to the cases with normal temperature (0.0%).

Table 11: Relationship between Outcome and Blood Pressure

Blood Pressure	Outcome		Total	Odds Ratio (95% CI)	p - value
	Death	Survived			
Normal	6 (0.4%)	1609 (99.6%)	1615	299.7 (106 - 844)	<0.001
Abnormal	19 (52.8%)	17 (47.2%)	36		
Total	25 (1.5%)	1626 (98.5%)	1651		

There was a significant relationship between outcome and blood pressure. The table revealed that the death cases were significantly higher in cases with abnormal blood pressure (52.8%) compared to the cases with normal blood pressure (0.4%). The odds ratio indicated that the cases with abnormal blood pressure had 299.7 times more chance for death than the cases with normal blood pressure.

Table 12: Relationship between Outcome and CRT

CRT	Outcome		Total	p - value
	Death	Survived		
Normal	0 (0.0%)	1412 (100.0%)	1412	<0.001
Abnormal	25 (10.5%)	214 (89.5%)	239	
Total	25 (1.5%)	1625 (98.5%)	1651	

Here the p-value was less than the significance level 0.05, the relationship between outcome and CRT was significant. That is, there was a significant relationship between outcome and CRT. The table revealed that the death cases were significantly higher in cases with abnormal CRT (10.5%) compared to the cases with normal CRT (0.0%).

Table 13: Relationship between Outcome and SpO_2

SpO2	Outcome		Total	Odds Ratio (95%CI)	p - value
	Death	Survived			
Normal	2 (0.2%)	1328 (99.8%)	1330	51.25 (12.0 - 219)	<0.001
Abnormal	23 (7.2%)	298 (92.8%)	321		
Total	25 (1.5%)	1626 (98.5%)	1651		

There was a significant relationship between outcome and SpO_2. The table revealed that the death cases were significantly higher in cases with abnormal SpO_2 (7.2%) compared to the cases with normal SpO_2 (0.2%). The odds ratio indicated that the cases with abnormal SpO_2 had 51.25 times more chance for death than the cases with normal SpO_2.

Table 14: Correlation between SICK Score and Duration of Stay - Ward

	Mean	SD	p - value
SICK Score	3.829	1.034	<0.001
Duration of Stay – Ward (Days)	3.668	1.943	

There was a significant correlation between SICK score and duration of stay (ward). A significant and positive correlation indicated that duration of stay increased with increase in SICK score and decreased with decrease in SICK score.

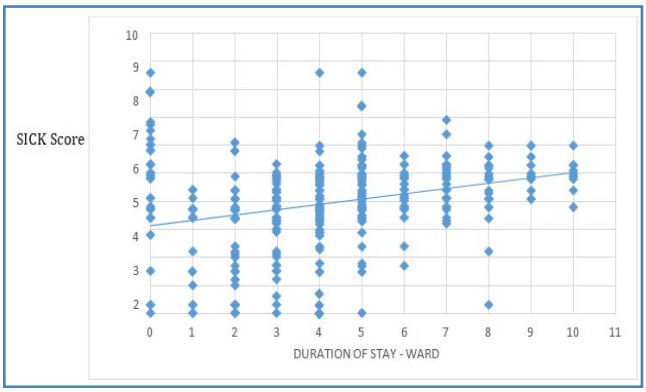

Figure 3: Correlation between SICK Score and Duration of Stay - Ward

Table 15: Correlation between SICK Score and Duration of Stay - PICU

	Mean	SD	p - value
SICK Score	3.829	1.034	<0.001
Duration of Stay – PICU (Days)	1.209	2.002	

There was a significant correlation between SICK score and duration of stay (PICU). A significant and positive correlation indicated that duration of stay increased with increase in SICK score and decreased with decrease in SICK score.

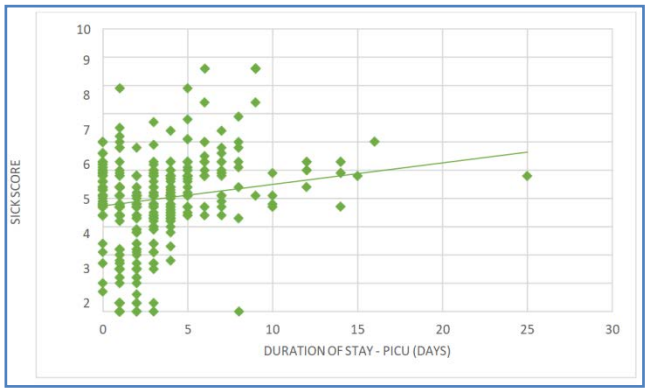

Figure 4: Correlation between SICK Score and Duration of Stay – PICU

Table 16: Correlation between SICK Score and Total Duration of Stay

	Mean	SD	Co relation coefficient	p - value
SICK Score	3.829	1.034	0.359	<0.001
Total Duration of Stay (Days)	4.877	2.744		

There was a significant correlation between SICK score and total duration of stay. A significant and positive correlation indicated that duration of stay increased with increase in SICK score and decreased with decrease in SICK score.

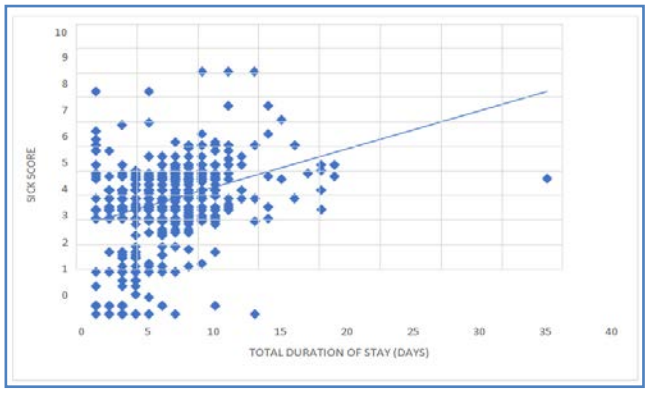

Figure 5: Correlation between SICK Score and Total Duration of Stay

Table 17: Distribution of Outcome and SICK score

SICK	Outcome		Total
	Death	Survived	
0.0 - 1.0	0 (0.0%)	59 (100.0%)	59
1.1 - 2.0	0 (0.0%)	46 (100.0%)	46
2.1 - 3.0	0 (0.0%)	30 (100.0%)	30
3.1 - 4.0	0 (0.0%)	752 (100.0%)	752
4.1 - 5.0	9 (1.3%)	673 (98.7%)	682
5.1 - 6.0	9 (13.6%)	57 (86.4%)	66
6.1 - 7.0	4 (44.4%)	5 (55.6%)	9
7.1 - 8.0	2 (50.0%)	2 (50.0%)	4
8.1 - 9.0	1 (33.3%)	2 (66.7%)	3
Total	25 (1.5%)	1626 (98.5%)	1651

It was seen that maximum number of deaths occurred between score 4.1 and 6. There were no deaths at a score $\leq$ 4.

Table 18: Distribution of Outcome and Number of Abnormalities

Number of Abnormalities	Outcome		Total
	Death	Survived	
Nil	0 (0.0%)	466 (100.0%)	466
One	0 (0.0%)	405 (100.0%)	405
Two	0 (0.0%)	256 (100.0%)	256
Three	0 (0.0%)	299 (100.0%)	299
Four	0 (0.0%)	146 (100.0%)	146
Five	2 (4.4%)	43 (95.6%)	45
Six	14 (63.6%)	8 (36.4%)	22
Seven	9 (75.0%)	3 (25.0%)	12
Total	25 (1.5%)	1626 (98.5%)	1651

It was seen that when there were 6 abnormal physical variables in SICK score, there were 14 deaths(63.6%) and 36.4% survived. It can be seen from the table that as the number of abnormal variables in SICK score increased, there was increased mortality.

Discussion

Scoring systems have been mainly developed for prediction of mortality, evaluation in research i.e. to adjust for the differences in the case variety or for the purpose of stratification in randomized control trial, comparative purpose and for clinical management of patients(i.e. as triage tool or as a rapid tool to convey patient information). The ultimate purpose of triage is to determine whether the patient is appropriate for a given level of care and to ensure that hospital resources are utilised effectively.

Nienke et al studied that Paediatric Early Warning Score based on physical parameters such as Heart rate, Respiratory rate, Temperature, Oxygen saturation, Blood pressure, Level of Consciousness and also age of the child can be used to detect children presenting to the emergency department who are in need of intensive care unit care[6]. The area under the ROC curve for predicting ICU admission was 0.6(95% CI: 0.57 – 0.62). They also concluded that if the parameters in the score are summed to a numerical value, were better able to identify high risk children. Mortality can be reduced if effective care and steps are undertaken at the first point of contact with a sick patient since lead time is critical in the first 24 hours of a critically ill child. The window of opportunity of managing a child aggressively is lost by the time results of scoring systems like PRISM and PIM are available. SICK score can be used as a triage tool at the time of first contact with the patient and can predict the severity of illness and mortality.

In the present study conducted in the patients in the age group of 1 month to 12 years admitted in the pediatric

unit of Jubilee Mission Medical college and research institute, Thrissur from January 2018 – June 2019. It was a prospective observational study done on 1651 pediatric patients. All the parameters in SICK score (Loss of consciousness, Heart rate, Respiratory rate, Temperature, Blood Oxygen saturation, Capillary refill time, Blood pressure) and also age were recorded at the time of admission and SICK score was calculated. Harmesh S Bains in a prospective observational study done on 777 children admitted in the paediatric unit found that mortality increased with increase in number of abnormal variables(Temperature, Oxygen saturation, Pulse rate, Respiratory rate, Sensorium, Seizure) in the "TOPRS' clinical score[7]. Temperature, Oxygen saturation and respiratory rate were having significant effect on the outcome (discharge/ death) with P value being 0.04, <0.01, <0.01 respectively. Thompson et al concluded on a study on 700 children in a tertiary care centre in England that a combination of vital signs can be used to identify and differentiate children with serious infection from those with less serious infections and this method has comparable sensitivity to more complicated triage systems[8].

Of the total 1651 patients, we had 25 deaths accounting for about 1.5% . Among the children who died, 16 were male and 9 were female. Of the total admissions, most of the patients were included under respiratory system about 42%. Next system was gastrointestinal system coming to about 20%. Next in line was Nervous system which accounts for about 18%. There were about 58% males and 42% females. In a study on representative pediatric population in Hong Kong, overall 59 % of the total admissions were males. This could be due to the fact that male preponderance was seen in diseases like asthma, bronchiolitis, gastroenteritis, accidental ingestion of substances and febrile seizure[9]. In the present study, the relationship between outcome and sex was not significant. That is, there was no relationship between outcome and sex. Death cases are almost same in male (1.6%) and female (1.4%).

In our study, SICK score and outcome had a significant relationship. Total SICK score was high(Mean = 5.828) in patients who died than who survived (Mean = 3.798) . Most importantly ROC curve drawn at a cut off of 4.8 had area under the curve 0.964. This result was consistent with similar study done in Puducherry(93%)[5]. Area under the ROC curve in development cohort was 89% [4]. Accuracy of prediction was found to be 85.3%. At 4.8 cut off score, SICK score had specificity of 85.1%. These findings suggest a high probability of generalizability. Bhal S et al on application of both SICK score and PRISM score on 125 admissions to the paediatric intensive care unit, found that SICK score can predict severity of illness with nearly the same accuracy as the PRISM score[10]. The area under the ROC curve was 0.76 for SICK score and 0.78 for PRISM score. ROC curve drawn at a cut off of 4.74 in a study for validation of SICK score done in 2012 showed sensitivity of 96.8% and specificity of 99.5%[11].

In the present study, it was found that all the parameters in SICK score had statistically significant correlation with outcome.

AGE: Age group was considered into three categories : <1 year, 1 – 5 years, > 5 years. It was seen that most of the children belonged to the age group of 1 – 5 years (54.3. 18 children died in the less than 5 age group i.e. 1.3%. In that mortality was significantly high in less than 1 age group being about 3.2%. India has a high burden of under 5 mortality rate i.e. about 37 per 1000 live births.

SENSORIUM: None of the expired patients had a normal sensorium recorded at admission. Death was significantly high ($p < 0.001$) in children with abnormal level of consciousness. This significant association between outcome and sensorium was in accordance with the similar studies done before. In a study done in New Delhi, the odds of death was 11 time more in patients with abnormal sensorium than normal sensorium[4]. In a study from India enrolling about 127 patients with abnormal sensorium and associated fever, the mortality was 16.5%[12]. However studies from Nigeria revealed a higher mortality of 32.5%[13]. Altered sensorium was thus an important component in the prediction of outcome of the patient.

HEART RATE: The present study revealed that Heart rate was abnormal in almost all cases of death. 70.2 % of the children had normal heart rate at initial presentation and hence increased chance of survival. Prospective study by Babji SK et al revealed that heart rate was not significantly associated with the outcome of patient[5]. The difference in the present study with other studies may be due to more number of sick children attending our tertiary care centre with involvement of more than one system. The statistical power of the study to detect a significant difference in mortality between normal and abnormal values of heart rate were 40% and 28% respectively in the development study[4]. But the recent advancement of Heart rate variability may be taken into consideration for patients admitted in PICU.

RESPIRATORY RATE: In the present study, Respiratory rate had a significant association with death. Most of the patients were having an illness related to respiratory system(42% of the total number of cases). This result may be due to the fact that ours being a tertiary referral centre and most of the cases being referred being sick respiratory cases. In a study conducted by Miguel P et al fast breathing as a sole clinical sign showed the highest sensitivity of 74% and specificity of 67%[14]. The fact that fast breathing was considered to be an important clinical sign to be included in

the WHO classification of pneumonia showed the significance of respiratory rate.

TEMPERATURE: In the present study, patients who had abnormal temperature had a significant association with mortality. This result was in contrast to the study done by Babji SK et al in which the difference in mortality rates between those in normal and abnormal range of temperature was not significant(p=0.47) which indicated that mortality was independent of temperature[5]. But the present study result is in agreement with the original study by Kumar N et al in which abnormal temperature was recorded in 19 of the total 44 death cases and had a p value of <0.01[4].

CAPILLARY REFILL TIME: CRT which is a sign to assess the cardiovascular status of the child was found to be abnormal in 14.4 % of the children. It could be due to dehydration, as evidence of shock or due to decreased peripheral perfusion. Diarrhea cases accounted for about 11.6% cases with much of the children suffering from some dehydration. This also could be a reason for a high number of patients with abnormal CRT. Studies have revealed that prolonged CRT has a fourfold greater risk of dying compared to a child with normal CRT[15]. These facts strongly reinforces Integrated Management of Childhood Illness guidelines (that an abnormal CRT reflects shock and should be managed without delay) by WHO.

BLOOD PRESSURE: Blood pressure as an important predictor for survival was well established from our study. But it was obvious that in that 2.4% with hypotension, 52.8% of the population died which was a very significant number of children. Studies on children in Netherland revealed high specificity for BP measurement in seriously ill children[16]. So a combination of the different physical parameters in SICK score could predict the outcome of a child at admission itself and thus enable the health worker to remain alert and stabilise the child before worsening.

BLOOD OXYGEN SATURATION: 23 out of 25 deaths had abnormal blood oxygen saturation. Oxygen saturation if abnormal has a significant association with mortality (7.2%) than normal (0.2%). The finding in the present study was in agreement with similar studies done earlier. The pooled analysis from study on hypoxemia have showed that a child with SpO_2 below 90% have a five fold increase in risk of death[17]. A review earlier published identified only 3 studies which were based on mortality in children and hypoxemia[18].

DURATION OF STAY IN THE HOSPITAL: The correlation between SICK score and duration of stay in the hospital had a high positive correlation with an average duration of 4.877 days (=mean) and SD = 2.744. The correlation between SICK score and total duration of hospital stay was significant (p<0.001). On further observation, it could be understood that patients with a score of 5.5 or more required hospital stay for a minimum of 8 days. Increasing SICK score implies that the health worker should be prepared to anticipate a longer hospital stay for the child. Correlation between duration of stay in the ward and PICU separately also showed similar results. It was found that an admitted patient had a minimum duration of ward stay for 3.668± 1.943 days. Similar duration for PICU was 1.209 ± 2.002.

The correlation between SICK score and duration of hospital stay was not done in previous studies. This was a new finding which could be useful in the clinical setting.

Since there was a significant association between SICK score and outcome of the patient, the Null hypothesis can be rejected.

Limitations

- Recording of clinical parameters was done by the duty paediatrician. Interpersonal variability among attending pediatricians have not been specifically looked.
- Parameters like heart rate were not adjusted for temperature.
- Temperature measurement was done at axilla and not in the recommended area of tympanic membrane.

Summary

Prospective observational study which included 1651 patients in the age group of 1 month to 12 years of age was done. The study was done with the objective to assess the usefulness of SICK score in predicting the outcome of patients admitted to the pediatric unit, to assess the correlation between outcome and individual parameters in SICK score and to assess the correlation between SICK score and duration of stay in the hospital. The parameters in SICK score - Heart rate, Respiratory rate, Temperature, Capillary Refill Time, level of consciousness, blood oxygen saturation, Blood pressure and also age was recorded at the time of admission. Also duration of stay in the hospital was recorded. The total SICK score was calculated

54.3% of the study populated included children between 1 and 5 years of age. 98.5% of the cases survived and 1.5% of the cases expired. SICK score was significantly high in expired patients. Area under ROC curve was 0.968 at the cut off of 4.8. At score 4.8, Sensitivity was 100% and specificity was

85.1%. Death cases were significantly higher in 1 month to 1 year (3.2%) compared to age 1-5 years (1.0%) and more than 5 years (2.0%). There was no relationship between outcome and sex. Expired number of cases were almost same in male (1.6%) and female (1.4%). All the seven parameters in SICK score had significant association with

outcome. There was no mortality at a score < 4. As the number of abnormal variables in SICK score increased, there was increased mortality. Correlation between SICK score and total duration of stay in the hospital was significant.

Hence we conclude that SICK score can be used in effectively triaging the patient at initial presentation especially in a resource poor setting.

Conclusion

The study was done among 1651 patients admitted to the pediatric unit. Among them, 25 children expired. The cut off score at 4.8 showing 100% sensitivity and 85.1 % specificity and also comparing with the previous studies suggest a high possibility of generalizability for the study. Mortality was high in the under 5 age group. Sensorium, Heart rate, Capillary refill time, Blood pressure had a significant association with mortality which emphasizes on the importance of recording these vital parameters at admission itself along with respiratory rate and temperature. Initial high SICK score value could be used as a tool for anticipating a prolonged duration of stay in the hospital. This will help the health worker to be prepared and triage the patient at initial assessment itself to categorise the child according to the severity of illness. Performance of SICK score in identifying a sick child prompts to utilise it as an emergency triage tool. Thus it can be concluded that SICK score can be recommended as a triage tool so that effective action can be taken for a sick child to prevent unnecessary delays. SICK scoring system based on physical variables do not require special training to be used in triage It is a good scoring system which will help to prioritize care.

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