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Original Article

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Comparison of Rapid Acute Physiological Score (RAPS) with Modified Rapid Emergency Medicine Score (mREMS) in Prediction of Mortality in Traumatic Injury Patients Presenting to Emergency Medicine Department: A Prospective Observational Study

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Abstract

Objective: This study aims to assess and compare the prognostic value of Rapid Acute Physiological Score and modified Rapid Emergency Medicine Score for mortality and outcome of trauma patients presenting in Emergency department. ***Methods:*** This prospective observational study was conducted among patients > 18 years age presenting with traumatic injury at B J Medical College. The RAPS and mREMS were calculated. The efficacy in predicting mortality was evaluated using ROC curve analysis. ***Results:*** In the 200 patients studied (68% males) 43.5% were in 18-30 years age group. Mortality rate was 7.50% (n = 15), also found that among 15 non-survivors, 93.33% each had RAPS >6 and mREMS >8. Sensitivity, specificity, positive predictive value and negative predictive value of RAPS and mREMS for mortality were 93.33%, 96.75%, 70%, 99.44% and 99.92%, 93.51%, 55.55% and 99.97% ($p<0.0001$) respectively. ROC curve for RAPS and mREMS score was 0.981 and 0.995 respectively, showed no significant difference ($p=0.143$), but mREMS was slightly superior to RAPS in predicting mortality. ***Conclusion:*** We found that mREMS score is comparable to RAPS and marginally superior in predicting death and vegetative state. We also found that mREMS score is rather better predictor of severe disability (morbidity) than RAPS in trauma.

Keywords: ***Emergency department, Morbidity, Mortality, mREMS modified Rapid emergency medicine score), RAPS (Rapid acute physiological score), Traumatic injury.***

Introduction

Trauma is a major public health issue worldwide and traumatic injuries claim almost 4.4 million lives and constitute nearly 8% of all deaths in each year around the world [1]. In India every 1.9 minutes there is a death that is related to trauma causing disability, morbidity and financial loss [2-4]. Among these, 22.8% injuries take place due to road traffic accident [2] and other causes include fall from height, assault, blunt injuries, penetrating injuries, self-harm etc. Decrease in morbidity and mortality rates in trauma patients is strongly related to appropriate treatment and timely management (10.4% versus 13.8%, relative risk [RR] 0.75, 95% CI 0.60-0.95) [5,6]. For this department of emergency medicine and emergency physicians play a major role. However, constant overcrowding of patients can compromise timely management in emergency department (ED).

The ability to quickly and accurately predict outcomes for trauma patients can significantly influence the treatment, decision and resources allocation. The use of a scoring system not only reduces the time needed to evaluate patients but also improves the

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quality of care [10], thereby improving treatment efficiency and reducing morbidity rates. Researchers have used scoring systems to assess the severity of injuries, provide an objective measure for treatment and allocate health care resources appropriately [11].

Over the years, several scoring systems have been developed from the existing ones to aid in the assessment of trauma severity and predict patient outcomes. But still there is a need of universally accepted and valid trauma scoring system which will help in rapid evaluation and treatment of trauma patients worldwide.

Rapid acute physiological score (RAPS) is an abbreviated and simplified version of APACHE II. It includes the variables like heart rate (HR), mean arterial pressure (MAP), respiratory rate (RR), Glasgow coma scale (GCS). It enables a rapid assessment without the need for extensive patient history or complex calculations. For clinical use the prognostic value of this model is acceptable, but to improve its accuracy, further research on modifications is being done in emergency department [16,21].

The Rapid Emergency Medicine Score (REMS) (2004) is a score that has been validated to predict mortality for medical (non-trauma) hospital admissions [17,22]. This score also includes the variables of RAPS along with oxygen saturation (O2 saturation) and age. This score also proved to be a comfortable and accurate predictor of inpatient mortality in trauma patients [18]. When REMS was applied to trauma patients in a retrospective study, an age appeared to be over-weighted and the GCS appeared to be under-weighted [19]. Therefore most recently developed model is modified Rapid Emergency Medicine Scoring system (mREMS) which includes chronological age and oxygen saturation to variables included in RAPS.

The RAPS and mREMS model are both very feasible and can be easily used in ED for trauma patients' care. However there are very few studies which have compared these two models with each other [20]. This study aims to assess and compare the prognostic value of RAPS and mREMS for mortality and outcome of trauma patients presenting in ED.

Methods

Study Area: Emergency Medicine Department, Civil Hospital, Asarwa, Ahmedabad, Gujarat- 380016

Study Population: All patients aged more than or equal to 18 years presenting to emergency department with traumatic injuries in study period according to inclusion and exclusion criteria were included in the study.

Sample Size: Sample size was of 200 patients.

Study Design: Prospective observational study.

Study Variables: Patient's demographic parameters (age, gender, mechanism of trauma), Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure, Respiratory rate, Heart rate, Level of oxygen saturation, Glasgow coma scale

Study Period: The study was conducted between April-2023 to July-2024 (one year and three months).

Subject Selection:

Inclusion Criteria:

- Participants > 18 years of age
- Participants and their relatives who were willing to provide written and informed consent.
- Patients having traumatic injury.

Exclusion Criteria:

- Refusal for consent
- Patient less than 18 years of age
- Pregnant women
- Patients having history of spontaneous fall down and self-inflicted injury.
- Patients who are heavily sedated or have received neuromuscular blockade.
- Patients who were transferred from another hospital or health care system.

Methodology

The study was initiated after obtaining the ethical clearance from the institutional review board. The informed consent was obtained in written form from the patients included in the study. If patient was not able to give consent, it was taken from bystander. The relevant details of the clinical history including the time of injury, mode of injury, past and personal history were recorded. General and systemic examinations were carried out after primary survey and stabilization.

Patients with history of trauma coming to emergency department had been prospectively assessed on demographic characteristics (age, gender and mechanism of trauma)

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Their sign, symptoms and findings of their physical examinations were recorded in data collection form.

↓

These following variables required for calculating RAPS and mREMS were recorded:

1. Age
2. Body temperature
3. Systolic and diastolic blood pressure
4. Heart rate
5. Respiratory rate
6. Level of oxygen saturation
7. Patients level of consciousness based on GCS

↓

All these factors had been measured for patients on arrival and then they were followed during their admission to record their final outcome (expired or alive) and condition in which they were discharged from hospital (Mild or no disability, moderate disability, severe disability, vegetative state or death)

↓

Outcome measurement on discharge from hospital or 72 hours after hospital admission (whichever was earlier) was evaluated using Glasgow outcome scale.

Primary outcome was in-hospital mortality and secondary outcome was poor outcome defined as developing severe disabilities.

Period of follow up: All these parameters were recorded within time frame of- from the point of admission to emergency department to 72 hours post admission or till discharge from hospital, whichever was earlier based on Glasgow outcome scale (**Table I**).

Table I: Glasgow outcome scale for evaluation of outcome

Death	Patient certified dead
Vegetative state	Patient is unable to interact with environment
Severe Disability	Patient is unable to live independently but can follow commands
Moderate Disability	Patient is capable of living independently but unable to return to work or school
Mild or No Disability	Patient is able to return to work or school

Statistical Analysis Plan: The analysis had included profiling of patients on different demographic, clinical and laboratory findings. A detailed analysis was undertaken of RAPS and mREMS scores. The average and the standard deviations of the scores were calculated separately for alive and dead patients. The analysis was undertaken for predicting the patient's outcome in terms of mortality, cross tables were generated and chi square test was used for testing of significance. Student t-test was used for comparison of quantitative outcome parameters. P-value <0.05 was considered statistically significant. SPSS software Version 22.0 was used for statistical analysis.

Algorithm of research project

Suspected trauma patients arrival to ED

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A written informed consent had been taken from the patient or closest attendant available

↓

Complete clinical history with reference to time of injury, mode of injury, past and personal history had been taken and general and systemic examination had been carried out

↓

RAPS and mREMS had been assessed at the same time of presentation to ED

↓

And after assessing both scoring system patient had been followed up to death/ discharge from hospital or 72 hours post admission whichever was earlier

↓

Outcome had been measured on Glasgow outcome scale

Results

The present study was aimed to compare predictive values of mREMS to RAPS in determining outcome of trauma patients according to Glasgow outcome scale. After following inclusion and exclusion criteria, a total of 200 patients were enrolled into the study.

The age distribution of the patients showed that the majority were in the age group of 18-30 years (43.5%), followed by 31-45 years (24.5%) and 46-60 years (20.5%). The elderly population (>60 years) constituted 11.5% of total patients with mean age of 38.03±16.19 years.

Out of the total 200 patients, 136 (68%) were males and 64 (32%) were females. The present study showed male predominance indicating more trauma exposure in males. It was observed that road traffic accidents (RTA) was the major cause of trauma in 105 (52.5%) patients, followed by assault in 55 (27.5%) patients and fall from height in 40 (20%) patients.

49% of patients in the present study had a favourable outcome, with mild or no disability. This suggested that a significant proportion of trauma patients had less severe injuries or who received timely and effective intervention, were able to recover well. However, combined percentage of patients with moderate (23.5%) and severe disability (20%) was notable indicating that a substantial number of patients experienced significant long-term impairment. The 3.5% of patients in a vegetative state and 4% of patients who died were critical figures, representing the most severe outcomes (**Table II**).

Mortality rate was 7.5% (n=15) in the present study. Among the 15 non-survivors, 6 patients had age > 60 years, 5 patients were in the age group of 46-60 years, 3 patients were in the age group of 31-45 years and 1 patient was in the age group of 18-30 years (**Table III, Figure 1**). It suggested that mortality rate increased with age as prevalence of comorbidities increased with age.

The cut-off value for RAPS was found >6 and mREMS score was >8 in our study. Our study found that among 15 non-survivors, 93.33% (n=14) each had RAPS>6 and mREMS>8.

The analysis of the RAPS and mREMS scores in our study revealed that both scoring systems effectively distinguished between survivors and non-survivors. In the RAPS group, nearly all patients with scores ≤6 survived (179 out of 180), while a significant proportion of those with scores >6 were non-survivors (14 out of 20). Similarly, in the mREMS group, most patients with scores ≤8 survived (173 out of 174), whereas a higher mortality rate was observed in those with scores >8 (14 out of 26). This indicated that higher scores in both systems were strongly associated with increased mortality (**Table IV, Figure 2**).

It was found that sensitivity, specificity, PPV and NPV for RAPS for predicting mortality in trauma patients were 93.33%, 96.75%, 70.00% and 99.44% (p<0.0001) respectively.

It was found that sensitivity, specificity, PPV and NPV for mREMS for predicting mortality in trauma patients were 99.92%, 93.51%, 55.55% and 99.97% (p<0.0001) respectively (**Table V**).

In the present study, it was found that AUC for RAPS and mREMS in predicting mortality was 0.981 and 0.995 (p=0.1438) respectively, which was slightly superior but was not statistically significant (**Table VI, Figure 3**).

The odds ratio of mREMS and RAPS in present study was 43.028 (CI 36.94 to 371.63) and 41.766 CI 24.29 to 762.01) respectively was calculated by logistic regression analysis. This indicated that both mREMS and RAPS were strong predictors of adverse outcomes in trauma patients, with mREMS showing slightly higher predictive power. The p-value <0.0001 indicates that this association is statistically significant.

Spearman's rank sum analysis showed a very strong positive correlation between RAPS and mREMS score with Spearman coefficient of 0.858. A p-value of <0.0001 was observed between both scores indicating statistically significant correlation (**Figure 4**).

We didn't include non- survivors (n=15) in prediction of severe disability. Out of 185 patients, only 40 patients (20%) had severe disability (morbidity). The cut-off value for prediction of morbidity in trauma patients for RAPS was >2 and mREMS score was >3 in our study. Among those 40 patients, 37 (92.5%) patients had RAPS score >2 and mREMS score >3.

The analysis of the RAPS and mREMS scores in relation to severe disability (morbidity) showed that both scoring systems effectively identified patients at higher risk. In the RAPS group, only 3 out of 117 patients with scores ≤2 developed severe disability, compared to 37 out of 68 patients with scores >2. Similarly, in the mREMS group, only 3 out of 111 patients with scores ≤3 had severe disability, while 37 out of 74 patients with scores >3 were affected. This indicated that higher scores in both RAPS and mREMS were strongly associated with an increased risk of severe disability (**Table VII, Figure 5**).

It was found that sensitivity, specificity, PPV and NPV for RAPS for predicting morbidity in trauma patients were 92.50%, 78.62%, 54.41% and 97.43% (p<0.0001) respectively.

It was found that sensitivity, specificity, PPV and NPV for mREMS for predicting morbidity in trauma patients were 92.50%, 74.48%, 50.00% and 97.59% (p<0.0001) respectively (**Table VIII**).

In present study, it was found that AUC for RAPS and mREMS in predicting morbidity was 0.911 and 0.920 (p=0.5896) respectively, which was slightly superior but not statistically significant (**Table IX, Figure 6**).

Table II: General characteristics of patients

Age group (in years)	**Frequency (n)**	**Percentage (%)**
18-30	87	43.5
31-45	49	24.5
46-60	41	20.5
>60	23	11.5
Total	200	100.0
Gender	**Frequency (n)**	**Percentage (%)**
Male	136	68.0
Female	64	32.0
Total	200	100.0
Mode of injury	**Frequency (n)**	**Percentage (%)**
RTA	105	52.5
Fall Down	40	20.0
Assault	55	27.5
Total	200	100.0
Glasgow outcome scale	**Frequency (n)**	**Percentage (%)**
Mild or No disability	98	49.0
Moderate Disability	47	23.5
Severe disability	40	20.0
Vegetative state	7	3.5
Death	8	4.0

Vital parameters	**Mean ± SD**
Heart rate	94.87±19.72 bpm
Systolic BP	117.58±20.52 mmHg
Diastolic BP	73.82±11.3 mmHg
Mean arterial pressure	88.36±13.7 mmHg
Respiratory rate	20.05±7.38 per min
Oxygen saturation	93.89±7.55 %
GCS	12.95±3.74

Table III: Age wise mortality distribution (%)

Age Group (in years)	Survival (n=185)	Mortality (n=15)	Total (n=200)
18-30	86 (43%)	1 (0.5%)	87
31-45	46 (23%)	3 (1.5%)	49
46-60	36 (18%)	5 (2.5%)	41
>60	17 (8.5%)	6 (3%)	23
Total	**185 (92.5%)**	**15 (7.5%)**	**200**

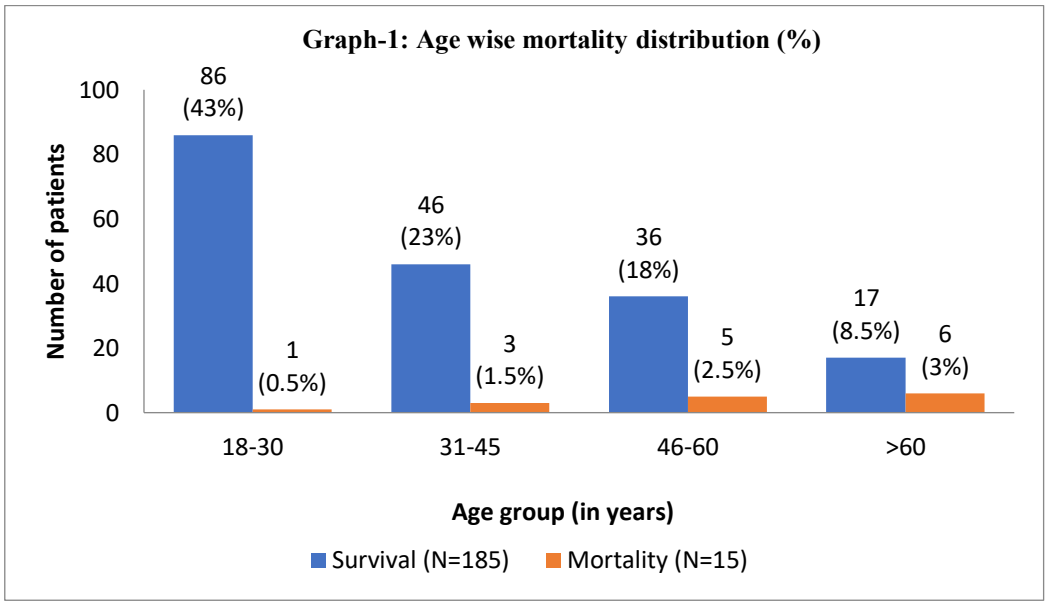

Fig 1: Age wise mortality distribution

Table IV: Distribution of mortality according to cut-off value of RAPS & mREMS

	RAPS		mREMS	
	≤ 6 (n= 180)	>6 (n=20)	≤ 8 (n=174)	>8 (n=26)
Survivor	179	6	173	12
Non-survivor	1	14	1	14
Total	**180**	**20**	**174**	**26**

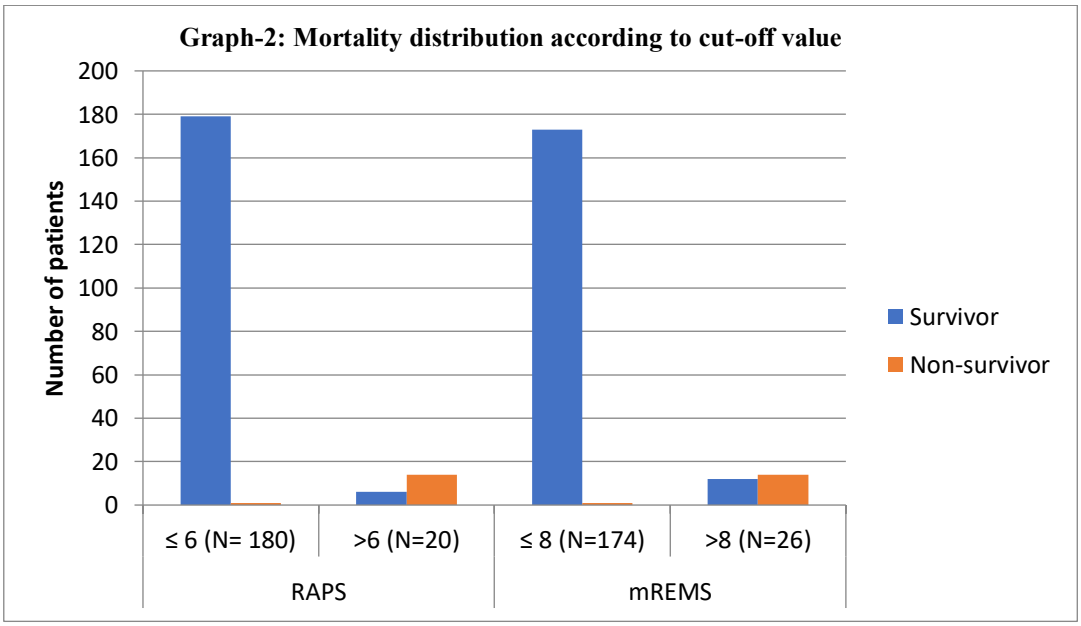

Fig 2: Mortality distribution according to cut-off value

Table V: Diagnostic values of RAPS and mREMS in prediction of mortality

	RAPS		mREMS	
		95% CI		95% CI
Sensitivity	93.333%	68.052% to 99.831%	99.92%	78.198% to 100.000%
Specificity	96.757%	93.075% to 98.801%	93.514%	88.944% to 96.604%

AUC	0.981	0.911 to 0.996	0.995	0.933 to 1.000
PLR	28.778	12.949 to 63.958	15.417	8.920 to 26.645
NLR	0.069	0.010 to 0.458	0.012	0.010 to 0.368
PPV	70.000%	51.217% to 83.834%	55.556%	41.970% to 68.358%
NPV	99.444%	96.421% to 99.916%	99.973%	99.946% to 99.999%
Accuracy	96.500%	92.922% to 98.581%	94.000%	89.754% to 96.862%
p-value	<0.0001		<0.0001	

Table VI: Comparison of AUC between RAPS total & mREMS total score in predicting mortality

Variable	AUC	SE [a]	Difference between areas	95% CI [b]	Z	p-value
RAPS	0.981	0.0122	0.0133	0.951 to 0.995	1.462	0.1438
mREMS	0.995	0.00391		0.972 to 1.000		

[a]DeLong et al., 1988; [b]Binomial exact

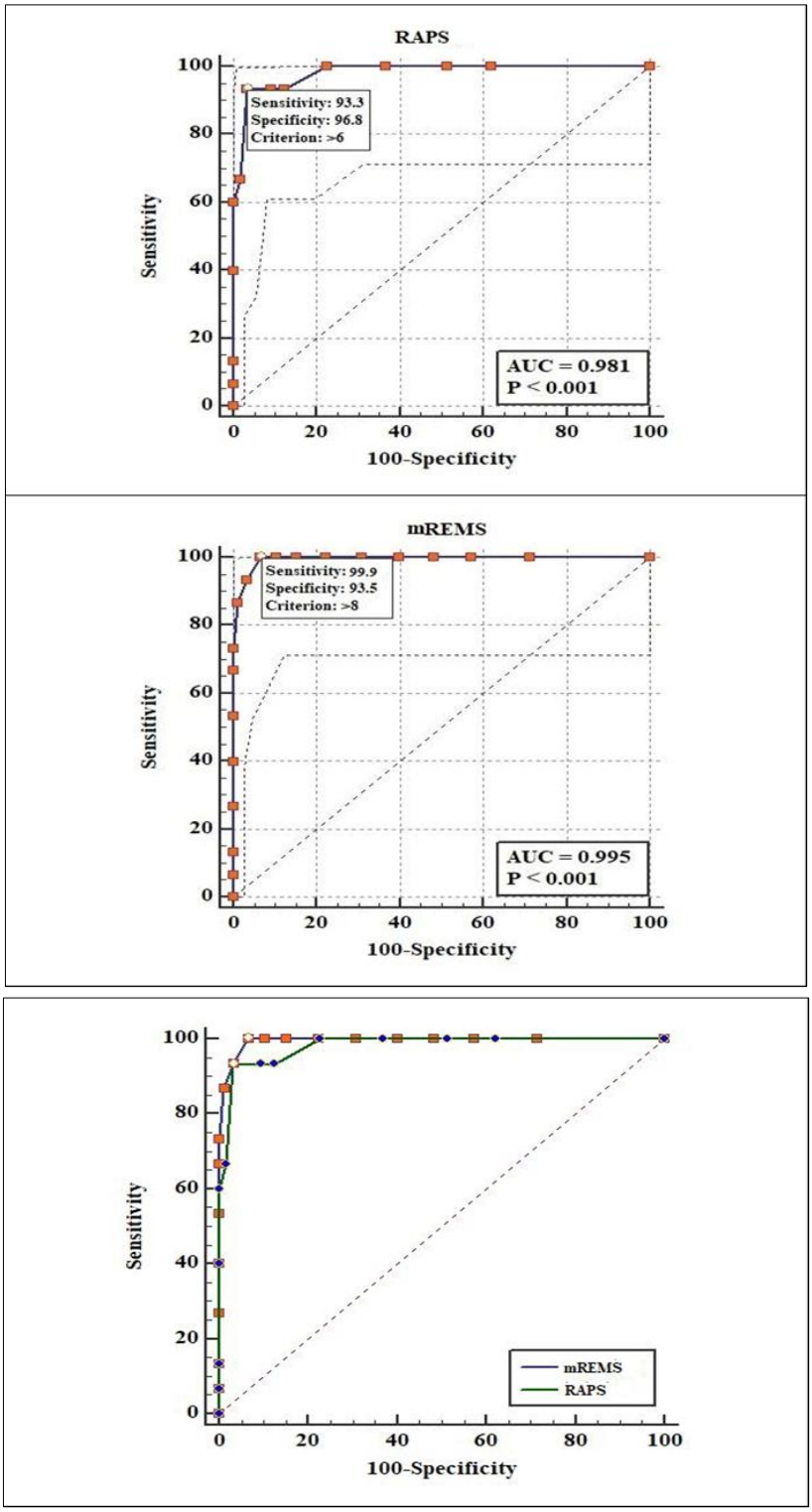

Fig 3: ROC curve of RAPS and mREMS in mortality prediction

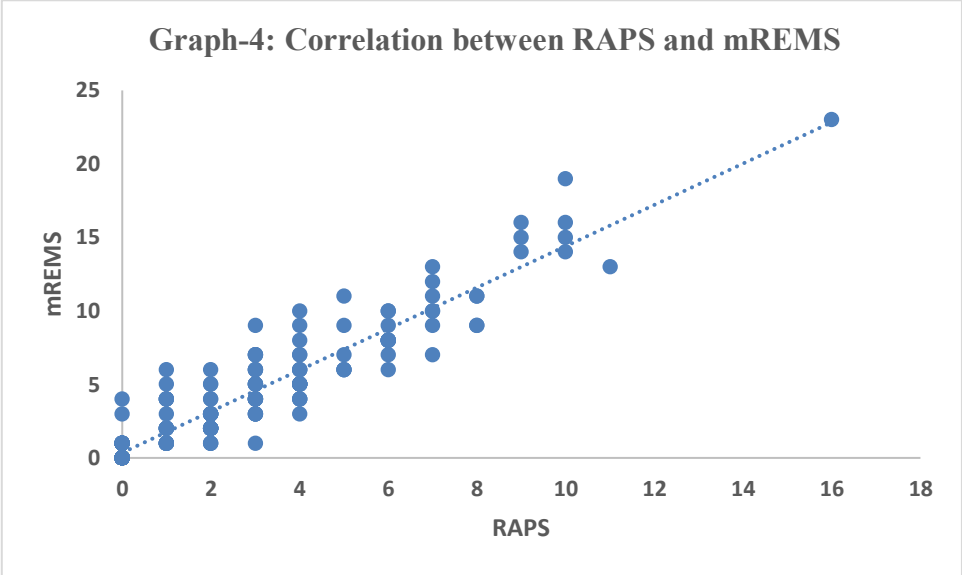

Fig 4: Correlation between RAPS and mREMS

Table VII: Distribution of morbidity according to cut-off value of RAPS & mREMS

	RAPS (n=185)		mREMS (n=185)	
Severe disability (morbidity)	**≤ 2 (n= 117)**	**>2 (n=68)**	**≤ 3(n=111)**	**>3 (n=74)**
No (n=145)	114	31	108	37
Yes (n=40)	3	37	3	37
Total	**117**	**68**	**111**	**74**

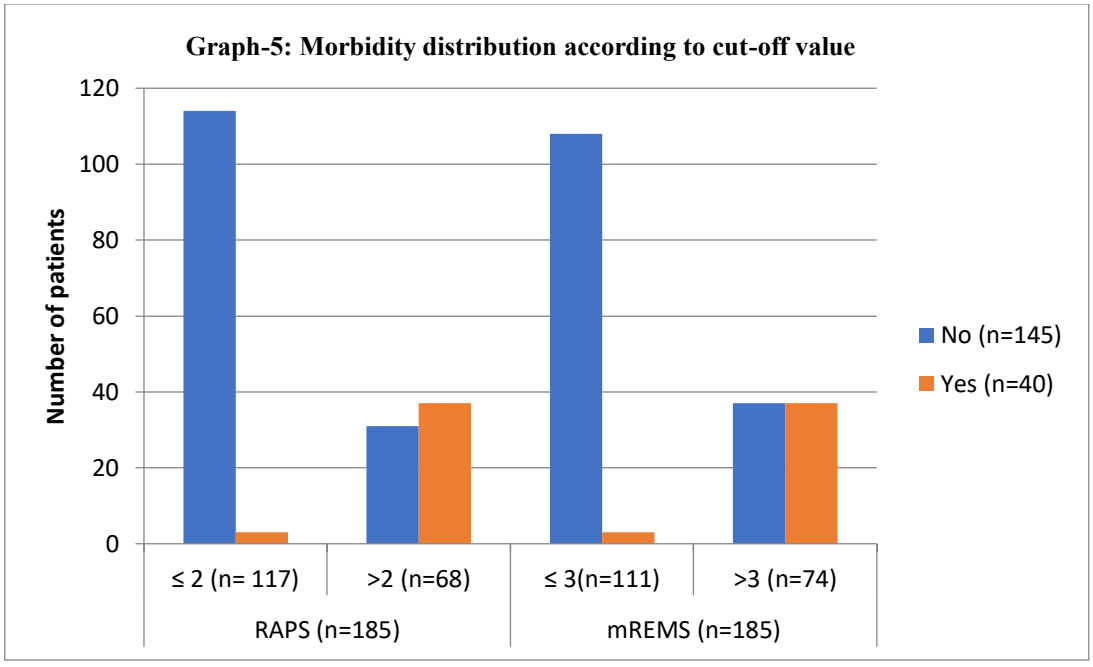

Fig 5: Morbidity distribution according to cut-off value

Table VIII: Diagnostic values of RAPS and mREMS in prediction of morbidity

	RAPS		mREMS	
		95%CI		**95%CI**
Sensitivity	92.500%	79.614% to 98.426%	92.500%	79.614% to 98.426%
Specificity	78.621%	71.048% to 84.988%	74.483%	66.584% to 81.354%
AUC	0.911	0.897 to 0.943	0.920	0.873 to 0.940
PLR	4.327	3.128 to 5.984	3.625	2.708 to 4.853
NLR	0.095	0.032 to 0.284	0.101	0.034 to 0.300
PPV	54.412%	46.321% to 62.276%	50.000%	42.757% to 57.243%
NPV	97.436%	92.730% to 99.124%	97.597%	92.351% to 99.077%
Accuracy	81.622%	75.277% to 86.924%	78.378%	71.743% to 84.081%
p-value	<0.0001		<0.0001	

Table IX: Comparison of AUC between RAPS total & mREMS total score in predicting morbidity

Variable	AUC	SE [a]	Difference between areas	95% CI [b]	z	p-value
RAPS	0.911	0.0223	0.00871	0.860 to 0.948	0.539	0.5896
mREMS	0.920	0.0199		0.871 to 0.955		

[a]DeLong et al., 1988; [b]Binomial exact

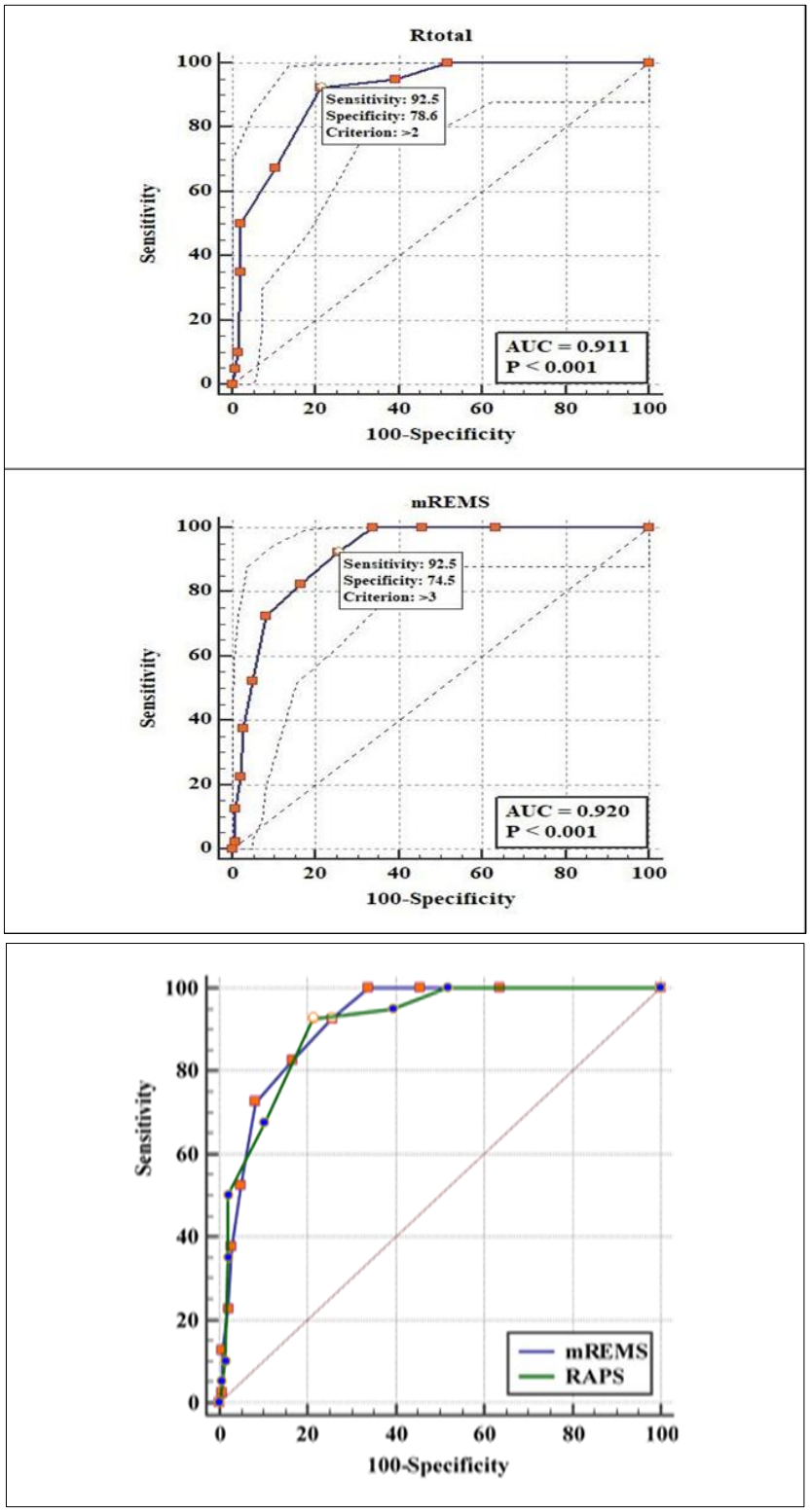

Fig 6: ROC curve of RAPS and mREMS in morbidity prediction

Table X: Comparison of diagnostic values of RAPS and REMS in predicting mortality with various studies

	RAPS			REMS (predecessor of mREMS)		
STUDY	**Sensitivity**	**Specificity**	**AUC**	**Sensitivity**	**Specificity**	**AUC**
Present study	93.33%	96.75%	0.981	99.92%	93.51%	0.995
Nakhjavan et al (2017)[25]	85.37%	83.37%	0.899	95.93%	77.63%	0.930
O. Garkaz et al (2022)[28]	61.39%	71.12%	0.620	85.19%	78.34%	0.720

Table XI: Comparison of diagnostic values of RAPS and REMS in predicting morbidity with other study

Score		Present study	Nakhjavan et al (2017)[25]
RAPS	Sensitivity	92.5%	77.27%
	Specificity	78.62%	84.64%
	AUC	0.911	0.860
	Cut off value	>2	≥2
REMS (predecessor of mREMS)	Sensitivity	92.5%	92.04%
	Specificity	74.48%	79.26%
	AUC	0.920	0.920
	Cut off value	>3	≥3

Discussion

Despite the many efforts of the health care system to curb the problem of trauma and to increase the quality of care services, trauma still remains a great concern worldwide. There has been 22% increase in trauma deaths in last decade [2]. It indicates the necessity for development of an easy and more reliable trauma scoring system and triage models to decrease mortality.

Very rapid and precise evaluation of trauma patients for prognosis and severity is crucial for the recovery because time plays a huge role in the outcome. There is a vital need to have a prediction system that will give faultless outcomes, while still being quick to use and clinically practical in emergency medicine and pre-hospital setup. Some scoring system, like APACHE score requires 12 physiologic measurements, patient's past medical history and invasive laboratory procedures to get final score which is too cumbersome to be quickly applied in emergency setting. On the other hand RAPS and mREMS scoring systems are quick to use and does not require any interventional measurements other than vital signs those are already taken up by emergency personnel.

The present study was aimed to compare predictive values of mREMS score to RAPS in determining the outcome in patients with trauma. After following inclusion and exclusion criteria, a total of 200 patients were enrolled into the study.

In present study, mean age of study population was found 38.03±16.19 years with predominance of younger patients and frequency decreased as age increased. Maximum patients were in age group of 18-30 years. This trend reflected the higher likelihood of younger individuals being involved in activities that resulted in trauma (e.g., motor vehicle accidents, sports injuries).

Similar result was found by Nakhjavan *et al*[25] in 2017 as 39.50±17.27 years. On the other hand, Miller *et al*.[24] in 2017 and O. Garkaz *et al*.[28] in 2022 reported a slightly higher mean age of 50.3±22.9 years and 61.5±18.05 years respectively.

In present study males were more in number than females, men contributed to 68% of the study population. Similar result was found by Nakhjavan *et al*.[25] in 2017 as 75%, Miller *et al*.[24] in 2017 and O. Garkaz *et al*.[28] in 2022 reported a 61.4% and 60.6% supported the male dominance in trauma patients, which might be due to increased vehicle use or alcohol abuse while driving by males.

Our study found that road traffic accident (RTA) was the major cause of trauma (52.50%), followed by assault (27.5%) and fall from height (20.0%). Nakhjavan *et al*.[25] also stated that motorcycle accident (27.51%), car rider accident (24.12%), the pedestrian (17.60%) and fall from height (16.44%) were the most common mechanisms of injury. Miller *et al*.[24] mentioned it in another way, like 89.3% of the population had blunt trauma compared to 10.7% having penetrating trauma, which may be RTA, fall or assault. Hyun oh park *et al*.[26] who compared EMTRAS (Emergency Trauma Score) with REMS found main causes of trauma were slips (30.7%), car accidents (23.3%) and falls (19.8%).

All these studies commonly uphold the involvement of road traffic accidents as commonest cause of trauma globally, and so as a major cause of mortality in modern era.

In our study, mortality rate was 7.50% (n=15), out of which 66.66% (n=10) were males and 33.33% were females.

Among, 15 non-survivors, 11 (73.33%) patients were above 45 years of age while the remaining patients were of between 31-45 and 18-30 years age. An increasing age has been noted to be associated with poorer outcome in trauma patients. It can be explained by presence of comorbidities in elderly patients leading to increased mortality rate in that age group.

Our study also found that among 15 non-survivors, 93.33% (n=14) each had RAPS >6 and mREMS >8. Mortality rate was high for both the groups above cut off. We found sensitivity and specificity for RAPS and mREMS score for mortality was 93.33% and 96.75% & 99.92% and 93.51% respectively. The AUC of RAPS and mREMS in predicting death and vegetative state (mortality) were 0.981 (95% CI: 0.911 to 0.996) and 0.995 (95% CI: 0.933 to 1.000).

Our study found that mREMS score is comparable to RAPS score and even slightly superior in predicting the outcome of mortality in the patients with trauma. Our study also found odds ratio of 41.766 for RAPS and 43.028 for mREMS score. It indicated that there was a strong positive correlation between mREMS score and RAPS. Previous studies have reported that REMS score is comparable to RAPS score in predicting the mortality in the patients with trauma, but no previous published study compared mREMS to RAPS, where there is a knowledge gap.

Nakhjavan *et al*. found that the sensitivity of REMS model was considerably higher than RAPS (95.93% vs. 85.37%), while its specificity was found to be lower than that of the RAPS model in predicting mortality (77.63% vs. 83.37%), which was similar to findings in our study.

O. Garkaz *et al*. found that sensitivity and specificity of REMS model were much higher than RAPS model which were (85.19% vs. 61.39%) and (78.34% vs. 71.12%), respectively. Compared to our study they had significant sensitivity and specificity difference probably because of increased sample size and difference in the treatment.

All of the above studies showed that AUC of REMS model was higher than that of the RAPS model. Both of these studies had concluded that value of REMS model in predicting mortality and poor outcome in trauma patients is higher than that of the RAPS model (**Table X**).

In our study, for calculation of severe disability (morbidity), we didn't include number of non-survivors (n=15), out of which 94.59% were males and 5.41% were females. Severe disability rate was found 20.00% (n = 40) in our study, among 40 patients, 15 patients were in age-group of 18-30 years while the remaining patients were of in age group of 46-60(n=12), 31-45(n=7) and above 60 years (n=6).

Our study also found that among 40 patients with severe disability, 37(92.5%) had RAPS score >2 and mREMS score >3. Morbidity was high for both the groups above cut off. We found sensitivity and specificity for RAPS and mREMS score for morbidity was 92.50% and 78.62%, and 92.5% and 74.48% respectively (p<0.0001).

The AUC of mREMS and RAPS in predicting severe morbidity were 0.920 (95% CI: 0.873 to 0.940) and 0.911(95% CI: 0.897 to 0.943), showed a statistically insignificant difference (p=0.589). It indicated that mREMS score was a better predictor than RAPS score and slightly superior in predicting the outcome of severe disability in the patients with trauma. Previous study reported that REMS score (predecessor of mREMS) was superior to RAPS score in predicting the mortality in the patients with trauma106, but no literature has previously compared mREMS to RAPS.

Nakhjavan *et al*.[25] who conducted a study to compare RAPS with REMS found that AUC of REMS and RAPS in predicting poor outcome were 0.92 and 0.86 respectively, with the difference being statistically significant (p=0.001), which was contrary to our study. Our study showed that AUC of mREMS model was superior to that of RAPS model (0.920 vs. 0.911) but was found statistically insignificant (p=0.589). They found a similar cut off value of REMS and RAPS in predicting morbidity ≥3 and ≥2 respectively as in our study with RAPS and mREMS. They concluded that adding age and the level of arterial oxygen saturation in RAPS model can increase its predictive value of poor outcome of trauma patients in ED (**Table XI**).

After extensive literature search we found that there is no other study that compared the severe disability parameter prediction of mREMS with RAPS. Hence this study was one of its kind that shed light on morbidity prediction in trauma patients in pre-hospital and emergency settings through these trauma scoring systems and found that mREMS model is better predictor than RAPS.

Conclusion

In conclusion, the mREMS score is a feasible triage score and an accurate predictor of outcome in trauma patients. Present study found that adding age score, the level of arterial oxygen saturation and replacing MAP to SBP to the variables included in the RAPS model improved its predictive power. Improving its predecessor REMS by decreasing weightage of age and increasing weightage of GCS gave well defined structure to mREMS in predicting outcome of trauma especially in traumatic brain injury [22]. Our study found that mREMS score is comparable to RAPS and marginally superior in predicting death and vegetative state. We also found that mREMS score is rather better predictor of severe disability (morbidity) than RAPS in trauma. Large scale multi-centric trials are required to validate if mREMS score is better than existing faintly used scoring systems in trauma.

Declarations

Ethical Clearance

The study was approved by Institutional Ethics Committee, B. J. Medical College & Civil Hospital, Ahmedabad vide no. EC/Approval/75/2023/31/07/2023.

Conflict of interest

None

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None

Contributors

SVS: Conceptualisation (lead), Writing (editing and review), Writing original draft (lead), Data analysis (supporting)

VP: Methodology (lead), Writing original draft (lead), Writing (review and editing) (lead), Data analysis (supporting), Data acquisition, data analysis and software (lead)

SG: Writing (editing and review) (supporting), Methodolgy (supporting), Writing (review) (supporting), Data acquisition, data analysis and software (supporting)

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