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ASSESSMENT OF PHYSIOLOGICAL PARAMETERS AMONG CRITICALLY ILL PATIENTS IN INTENSIVE CARE UNIT, AT TERTIARY CARE HOSPITAL, KODAGU"-AN OBSERVATIONAL STUDY

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Background of the Study: Intensive care units (ICUs) are dedicated for enhancing the survival of critically ill patients and require constant monitoring due to life threatening conditions. Vital signs is a cardinal indicator of a patient's health status. Modified Early Warning Score (MEWS), a scoring system based on vital signs, helps standardize patient assessment and allows for early recognition of patient's delicate distinctions, prompting appropriate escalation of care.

Aim: To find out the association of physiological parameters with selected socio- demographic variables and selected clinical variables among critically ill patients.

Methods: An observational study using a descriptive approach was conducted to assess the physiological parameters among (n=140) critically ill patients. Data was collected using sociodemographic, clinical variables and physiological variables were recorded using MEWS score from cardiac monitor. Participants were selected using convenience sampling method who were admitted in ICUs at tertiary care hospital, Madikeri between January 2025 to February 2025. Data was analyzed and interpreted by applying descriptive and inferential statistical methods

Results: In this study, out of 140 respondents 39(27.9%) of patients showed a MEWS scoring of 3-4 indicating the critically ill patients require continuous observation and monitoring in order to prevent further complications. Also 47(33.6%) of patients were showing signs of respiratory failure (MEWS ≥ 5) which indicated higher level of care

On the other hand, it is observed that there is a significant association between oxygen saturation (%) with age (χ^2=8.192, p=0.042), temperature(^{0}c) with gender (χ^2=4.726, p=0.030), systolic blood pressure(mmHg) with monthly family income ((χ^2=8.35, p=0.039) at 0.05 level of significance. There is also significant association between respiratory rate(breaths/min) with GCS category (χ^2=6.542, p=0.038) and critically ill category (χ^2=13.524, p=0.001), systolic blood pressure(mmHg) with patients on regular medication use (χ^2=5.040, p=0.025) at 0.05 level of significance.

Conclusion: MEWS is a simple, physiological score to prevent delay in intervention or transfer of critically ill patients. It is an important risk management tool that should be implemented for all ICU patients

Key words
MEWS score, Temperature, Pulse rate, Respiratory rate, Systolic blood pressure, Oxygen saturation, critically ill patients.

INTRODUCTION:

Critical care unit or Intensive care unit is a multidisciplinary and inter-professional specialty for the management of patients at risk of developing or with established life-threatening organ failure. It is dedicated for enhancing the survival of critically ill patients through the continuous assessment and monitoring of physiological parameters.[1,5]

Up to 20 million people annually require Intensive Care Units (ICUs) admission and mechanical ventilation (MV).[2] The pandemic has led to an unprecedented increase in the number of patients admitting to intensive care units. According to a WHO report, India tops the global chart in deaths due to critical illnesses among which lung disease being the common cause with 11 percent of the total deaths in the country.[3] The ICU environment has undergone significant transformations post COVID-19, prioritizing enhanced infection control measures, expanded ICU capacity, increased use of personal protective equipment's (PPE), integrated telemedicine, improved vital sign monitoring focusing on oxygen saturation (SPO2).[4]

The cornerstones of intensive care management are the optimization of a patient's physiology, the provision of advanced organ support, close monitoring of vital parameters, advanced haemodynamic monitoring, interventional procedures, management of complications identification and treatment of underlying pathological processes. Among these monitoring play's vital role which aims to detect organ dysfunction and guide in restoring organ function [6]

In critical care settings, where rapid decision-making is paramount, physiological insights guide interventions that stabilize patients and restore homeostasis. Real-time monitoring of physiological parameters informs immediate clinical responses, illustrating the pivotal role of physiological understanding in acute care[15].

The MEWS (Modified Early Warning Score) is a vital clinical tool used in healthcare to quickly identify patients at risk of serious deterioration by tracking simple physiological signs. It is a bedside scoring system, non-invasive, simple and repeatable to reflect dynamic changes in physiological state. MEWS scores were calculated based on seven physiological parameters recorded axillary temperature, respiratory rate, heart rate, systolic blood pressure, level of consciousness (using the AVPU scale), oxygen saturation[7]. MEWS spot early signs of patient deterioration, triggering faster responses, activating Rapid Response Teams (RRTs) and guiding timely interventions, ultimately preventing arrests, reducing mortality and improving overall outcomes by ensuring the right care level is reached sooner.[16]

Continuous monitoring provides a comprehensive overview of a patient's health status, allowing clinicians to recognize subtle changes in vital signs like heart rate, blood pressure, respiratory rate, temperature, and oxygen saturation. This allows for timely adjustments to treatment plans and, ultimately, improves the survival rates of critically ill patients by allowing for earlier intervention and care. Hence the study was conducted to acquaint the nurses with regard to practice and importance of MEWS scoring.

This study was necessary to establish a baseline for future research, as no prior studies had explored the combined relationship between physiological parameters and sociodemographic and clinical factors. This lack of comprehensive existing research makes the current study a foundational step for further investigation into these complex

associations. Hence the study was undertaken to assess the physiological, clinical parameters and find its association.

MATERIALS AND METHODS:

This study was conducted in accordance with the guidelines of ICMR for biomedical research on human subjects 2006.The study was approved by the Institutional Ethics Committee of Kodagu Institute of Medical Sciences, Madikeri (Ref.No- KoIMS/IEC/14/24-25).

Study Design and Data Collection

An observational study using a descriptive approach was undertaken in MICU & SICU at tertiary care hospital, Madikeri between January 2025 to February 2025 after obtaining a formal written permission from concerned authorities. The investigator personally visited the critically ill patients to know their critical status, explained the purpose of the study and informed consent was taken from the attenders of selected patients before starting the study. They were assured of anonymity and confidentiality. Based on inclusion and exclusion criteria 140 critically ill patients were selected using convenient sampling method. The inclusion criteria were patients admitted to medical & surgical ICU and aged > 18 years; both genders. Exclusion criteria were pregnant women and patients in prolonged state of deep unconsciousness(coma).

After selection the critically ill patients were categorised as following -

Level 1—Patients kept for observation, where they do not require organ support, just in need of an IV, or oxygen support by simple face mask or Non-Rebreather Mask (NRM).

Level 2— Patients needing single organ support (excluding mechanical ventilation) such as renal hemofiltration or inotropes and invasive BP monitoring.

Level 3—Patients requiring two or more organ support (or needing mechanical ventilation alone). [46].

Tool:

The Modified Early Warning Score (MEWS) was used to collect the physiological variables. at a bedside using cardiac monitor by the investigator. It included measured parameters like Temperature, Systolic blood pressure, Pulse rate, Respiratory rate, Oxygen saturation and Level of consciousness. A score of 0, 1, 2 or 3 is allocated to each parameter. Higher score represents greater hemodynamic instability. A score >=4 (sum of all the above 5 physiological parameters) for MEWS is statistically linked to an increased likelihood of death or admission to an ICU. For any single physiological parameter with score of +3, shows that the patient needs a higher level of care. A score >= 9 for MEWS is highly risky and could be a sign of imminent death[7]. Based on Subbe'sstudy[8], MEWS of 5 or greater is consider as a critically ill patient

Calculation:

MEWS score = Systolic blood pressure + Heart rate + Oxygen saturation+
Respiratory rate + Temperature + AVPU

The following table gives the three score categories[9]

MEWS score	Description	Risk of death or ICU admission
<3	Patient in a stable condition	7.9%
3-4	Signs of respiratory failure. Consider higher level of care.	12.7%
≥5	Patient in a critical condition. Higher level of care recommended.	30%

Statistical analysis of the outcome measures:

Statistical analysis was performed using SPSS software version 26.0 (IBM Corp.). Descriptive statistics are reported as mean, standard deviation [SD] for continuous variables and frequencies for categorical factors. Additionally, chi square test was used to find out the association between physiological variables with socio demographical and clinical variables. For all the analyses, statistical significance was set at a P-value of 0.05.

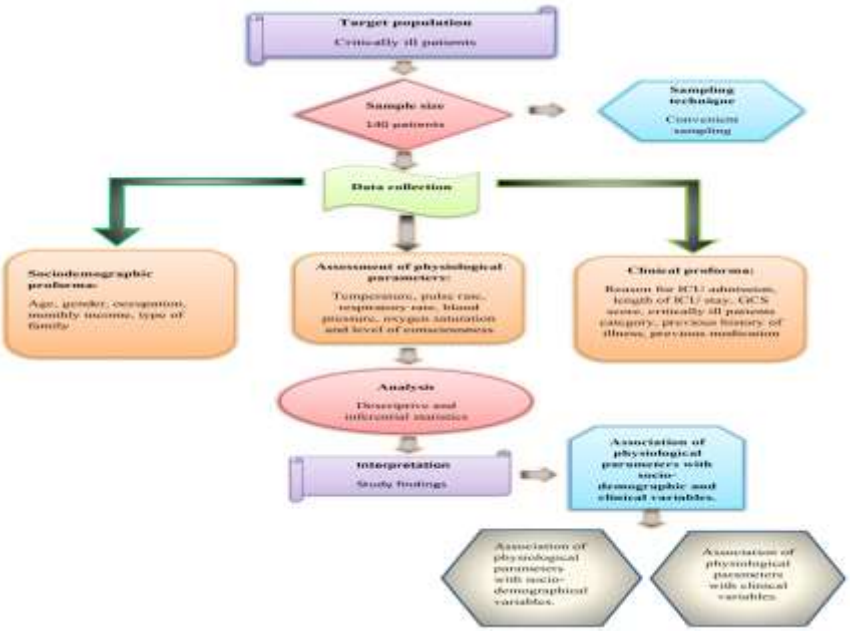

Fig 1: Consort Diagram

RESULTS:

Section A: Socio-demographic and clinical characteristics of the samples

Table 1: Distribution of demographic and clinical variables

N=140

Socio demographic and clinical variables		Frequency	Percentage (%)
Age in years	≤ 40	43	30.7
	41-60	47	33.6
	61-80	39	27.9
	>80	11	7.9
Gender	Female	60	42.9
	Male	80	57.1
Marital status	Married	116	82.9
	Unmarried	17	12.1
	Widow	6	4.3
	Widower	1	0.7
Occupation	Unskilled	59	42.1
	Semiskilled	27	19.3
	Skilled	21	15
	Others	33	23.6
Monthly Family Income (in Rs)	≤10,000	58	41.4
	10001- 25000	65	46.4
	25001-50000	11	7.9
	>50000	6	4.3
Type of Family	Joint family	16	11.4
	Nuclear family	124	88.6
Length of ICU stay (in days)	1 to 3	87	62.1
	4 to 6	43	30.7
	7 to 9	8	5.7
	> 10	2	1.4
Critically ill category	Level 1	104	74.3
	Level 2	25	17.9
	Level 3	11	7.9
GCS score	4-6	2	1.4
	7-9	21	15
	≥ 10	117	83.6
History of previous hospitalization/ admission to ICU?	No	103	73.6
	Yes	37	26.4
Regular medication use by respondents	No	100	71.4
	Yes	40	28.6

GCS-Glasgow coma scale; critically ill category[46]

Table 1 shows that among 140 critically ill patients surveyed the higher percentage 33.6% were in the age group of 41 – 60 years. More than half 57.1 % were male,82.9% were married.,46.4% had monthly family income between Rs10001–25000 ,88.6% were living in nuclear family. Majority of samples 61% had 1 to 3 days of hospital stay, greater part 83.6% were falling >10 GCS category where by 74.3% fit into level 1 critical ill category. And 73.6% did not had the history of previous hospitalization/admission to the ICU, also 71.4% were not on any medications regularly.

Section B: Assessment of physiological variables using MEWS Score

a. Physiological Parameters

Table 2: Range, mean, standard deviation and median of physiological parameters

N=140

Physiological Parameters	Range	Mean ± SD	Median
Respiratory rate (breaths/min)	10-28	19.93 ±2.52	20.0
Oxygen saturation (%)	86-100	95.66 ± 2.46	96.0
Temperature(°c)	35.20-39	37.03± 0.89	37.1
Systolic BP (mmHg)	92-188	130.68 ±22.41	125.5
Heart rate (beats/min)	56-142	87.09 ±15.28	86.0

b. MEWS Score Category

Table 3: Distribution of samples according to MEWS category

N= 140

MEWS category	Frequency	Percentage
Patient in stable condition	54	38.6
Sign of respiratory failure consider higher level of care	47	33.6
Patient in critical condition higher level care recommended	39	27.9

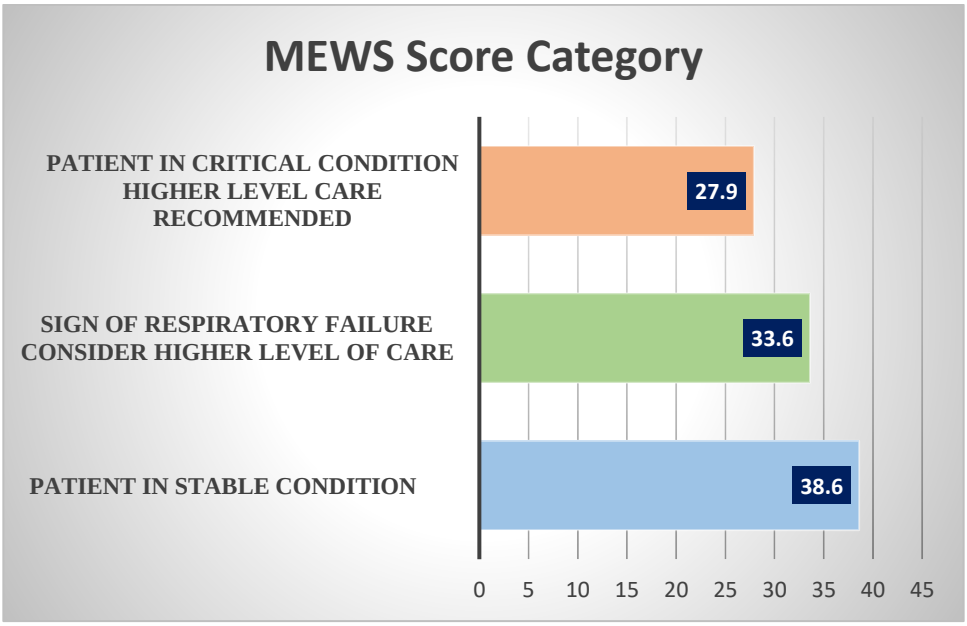

Figure 2: Bar graph showing distribution of samples according to MEWS category

Table no. 3 depicts the distribution of samples according to MEWS category, out of 140, 39(27.9%) of patients showed a MEWS scoring of 3-4 indicating the critically ill patients require continuous observation and monitoring in order to prevent further complications. Also 47(33.6%) of patients were showing signs of respiratory failure (MEWS ≥ 5) which indicated higher level of care.

Section C: Association of physiological parameters with selected socio demographic variables and clinical variables

Table 4: Association of physiological parameters with socio demographic & clinical variables
N= 140

Sl no	Parameter	Socio demographic variable	≤Median	≥Median	Total	χ2 test
1	Oxygen saturation	**Age in years**				
		≤40	22	21	43	χ^2=8.192, df=3, p=0.042*
		41-60	35	12	47	
		61-80	22	17	39	
		>80	4	7	11	
2	Temperature	**Gender**				
		Female	41	19	60	χ2=4.726, df=1, p=0.030*
		Male	40	40	80	
3	Systolic BP	**Monthly Family Income**				
		≤10,000	28	30	58	χ^2=8.357, df=3, p=0.039*
		10001- 25000	33	32	65	
		25001-50000	3	8	11	
		>50000	6	0	6	

		Clinical variable	≤Median	≥Median	Total	χ2 test
4	Respiratory rate	**GCS category**				
		4 to 6	1	1	2	χ^2=6.542, df=2, p=0.038*
		7 to 9	9	12	21	
		≥ 10	83	34	117	
		Critically ill category				
		Level 1	78	26	104	χ^2=13.524 , df=2, p=0.001***
		Level 2	11	14	25	
		Level 3	4	7	11	
5	Systolic BP	**Regular medication use**				
		No	56	44	100	χ^2=5.040, df=1, p=0.025*
		Yes	14	26	40	

*GCS-Glasgow coma scale; The statistical test used was Chi square test(χ^2) and the level of significance p<0.05 is considered significant and p< 0.001 (** Highly significant).*

Table 4 shows that, there was significant association between oxygen saturation (%) with age (χ^2=8.192, p=0.042), temperature(^{0}c) with gender (χ^2=4.726, p=0.030), systolic blood pressure(mmHg) with monthly family income ((χ^2=8.35, p=0.039) at 0.05 level of significance. There was also significant association between respiratory rate(breaths/min) with GCS category (χ^2=6.542, p=0.038) and critically ill category (χ^2=13.524, p=0.001), systolic blood pressure(mmHg) with patients on regular medication use (χ^2=5.040, p=0.025) at 0.05 level of significance.

DISCUSSION:

MEWS is a simple bedside scoring index that uses physiological parameters to identify patients who are at increased risk of catastrophic deterioration, resulting in ICU admission or death. The present study showed a significant association of physiological scores with socio demographic and clinical variables. These results were consistent with the study findings conducted by Bhatnagar, et al.2021[10], which showed that a MEWS score ≤5 or >5 during the first 24 hours of admission was correlated with the hospital outcome of the patient and Ursolino, G[15] disclosed that MEWS implementation is a valid tool to alert nurses in identifying a deteriorating patient condition for timely escalation of care. On the other hand, a significant association between oxygen saturation (%) with age was observed and these findings are concurring with Ljunggren et al.[11], in which vital signs were independently associated with 1-day mortality and age. There was also significant association between respiratory rate(breaths/min) with GCS category and this is supported by B. Sarang, et al[12]. findings which showed Glasgow Coma Score (GCS) and the vital signs had significant association with 24-hour mortality.

The body's systems are complex, even within the same demographic or clinical group, there is inherent biological variability, disease-specific effects in physiological responses and associations are often not due to a single variable but a combination of factors. Each variable has its own distinct biological pathway or mechanism through which it affects the body. Socio-

demographic variables: like age, sex, and socioeconomic status can influence lifestyle choices (diet, exercise), access to healthcare, and exposure to environmental factors that in turn affect physiology. Clinical variables: such as a diagnosis of a medical condition or a chronic disease directly impact specific organs, systems, or biochemical processes within the body.[14]

The MEWS improves nursing care by providing a standardized, objective way to spot patient deterioration early, triggering faster, consistent interventions, reducing subjective guesswork, and improving communication with doctors, ultimately preventing crises like cardiac arrest or ICU transfers and leading to better patient outcomes and safety. Nurses use MEWS to quantify subtle vital sign changes, enabling timely escalation to rapid response teams or physicians, ensuring patients receive critical care sooner[16].

Limitations:

The study was limited to single setting hence generalization of the findings is restricted. The narrow study design (without control group and a single observation) impacted the general utility of the findings.

CONCLUSION:

This study suggests that practising MEWS for recording physiological parameters helps to identify patients who are at increased risk of catastrophic deterioration in ICUs. MEWS score recognizes worsening condition among critically ill that can be forecasted through subtle changes in a number of patient parameters.

On the basis of the findings, it is recommended that a similar study may be replicated using a larger number of samples. It is also recommended that longitudinal study can be undertaken to detect changes, patterns, or trends.

Implications

The findings of this study imply that nurses assessing physiological parameters using MEWS score offers valuable learning opportunities and emphasizes the importance of continuous monitoring among critically ill patients in ICU. It allows nurse administrators to advocate for the allocation of resources to support the ICU. This study builds on to the existing body of evidence.

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