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Original Research Article

Analysis of maternal early obstetric warning systems as a indicator of obstetric morbidity

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Abstract

Aim and Objective: To evaluate early maternal warning triggers in the detection of maternal morbidity, by using two types of Early warning systems as a bedside screening tool and comparing their efficacy in routine use. To determine the effectiveness of maternal early warning scoring system as a screening tool for maternal morbidity. To compare the effectiveness of MEOWS chart over MEWT chart as screening tools for maternal morbidity in routine use.

Methods: From September 2019 to October 2021 (two years), a descriptive observational study was conducted at the department of obstetrics and gynecology, Kamineni Academy of Medical College and Research Centre, LB Nagar Hyderabad, India. Women who met the selection criteria for antenatal and postnatal care during the study period and gave their informed consent. 500 study participants were the sample size.

Results: Majority of study participants were in the age group of 21-25 years (45.2%). Mean age of study participants was 25.00 + 4.606 years ranging from 17 to 42 years. MEOWS colour coding and MEWT colour coding were matching in all the 500 cases in screening maternal morbidity (Kappa value of 1.00) and it was found to be statistically significant (P value <0.05).

Conclusion: We discovered that when screening for maternal morbidity, both the MEOWS and MEWT color coding matched in every instance. In order to identify early maternal warning signs by all healthcare professionals and thereby aid in the prevention of obstetric morbidity, we can use MEWT color coding, which is straightforward and simple to use with only 5 components as opposed to MEOWS color coding, which had 7 components.

Keywords: Maternal, obstetric, morbidity, predictor, MEOWS

Introduction

In many parts of the world, especially in low-income nations with scarce resources, preventing maternal mortality continues to be a significant challenge. Unfortunately, a lot of these deaths could be avoided. Finding physiological indicators of a conditional decline before such changes become fatally irreversible is one method of preventing maternal morbidity and mortality. Early detection and management of deteriorating patients have been prompted by early warning and trigger systems [1].

Early warning systems (EWS) created for the general population fail to take into account the special physiology of pregnant women and are ineffective at identifying obstetric patients

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who are at risk [2]. Obstetric EWS is advised for monitoring hospitalized pregnant and postpartum women's health based on predetermined abnormal values (warning signs) to trigger a quick medical response and facilitate early detection and management of clinical deterioration [3, 4].

In these systems, basic vital signs are routinely measured in order to monitor a patient's clinical condition over time, mitigate the risk of catastrophic events, and provide quick assistance if a patient triggers to predefined abnormal values. An unfavorable pregnancy outcome can be viewed as a continuum of deteriorating events, starting with a normal/healthy pregnancy and progressing through morbidity, severe morbidity, near misses, and death. Maternal morbidity can be identified and treated earlier with the help of a chart's track and trigger of physiological parameters. Maternal Early Obstetric Warning Systems (MEOWS) charts should be used regularly, according to the triennial Confidential Enquiry into Maternal and Child Health (CEMACH) report from 2003–2005. The study's objective is to assess the MEOWS chart's efficacy as a bedside screening tool for predicting maternal morbidity [5].

Several EWS have been developed and implemented in detecting early maternal morbidity across various nations. The recognition of alteration in the physiological parameters serves as the basic component of these charts and recording those parameters appropriately played a vital role in avoiding false positive rates and 'nuisance alarm' among the health care community. Therefore, EWS can be altered or modified according to the resources available in the health care setup and the person recording those parameters were trained appropriately. One such charts is MEWT- Maternal Early Warning Trigger chart [6] MEOWS chart used in our study involved seven physiological parameters and MEWT chart involved five physiological parameters.

Aim and Objectives

Aim

- To evaluate early maternal warning triggers in the detection of maternal morbidity, by using two types of Early warning systems as a bedside screening tool and comparing their efficacy in routine use.

Objectives

- To determine the effectiveness of maternal early warning scoring system as a screening tool for maternal morbidity.
- To compare the effectiveness of MEOWS chart over MEWT chart as screening tools for maternal morbidity in routine use.

Materials and Methods

A Descriptive observational study conducted at Department of Obstetrics and Gynaecology, Kamineni Academy of Medical College and Research Centre, LB Nagar Hyderabad, India from September 2019 to October 2021 (Two years). Antenatal and postnatal women admitted in the hospital during the study period satisfying the selection criteria after obtaining informed consent. 500 study subjects used as sample size.

Inclusion criteria

- All pregnant women >28 weeks of gestational age admitted in labour room of Kamineni Academy of Medical Sciences and Research centre.
- Women in prodromal labour (excluding women in active labour).
- Postnatal women during the entire hospital stay till the time of discharge.
- Participants who gave informed consent.

Exclusion criteria

- Antenatal/ postnatal women who are already requiring intensive care intervention or multiple interventions.
- Women with severe life-threatening complication/ morbidity.

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- Women in active labour (for whom partogram plotting is done).
- Participants who refused to give informed consent.

Results

A total of 500 cases were included in the study during the study period.

Table 1: Age distribution

Age group	Frequency (=n)	Percentage (%)
17-20	83	16.6
21-25	226	45.2
26-30	125	25.0
31-35	54	10.8
36-42	12	2.4
Total	500	100.0

Majority of study participants were in the age group of 21-25 years (45.2%) followed by 26-30 years (25%) and 17-20 years (16.6%). Only 12 cases (2.4%) were above 35 years.

Table 2: Gravida distribution

Gravida	Frequency (=n)	Percentage (%)
MULTI	306	61.2
PRIMI	194	38.8
Total	500	100.0

Out of 500 cases, 306 (61.2%) were multigravida and 194 (38.8%) were primigravida.

Table 3: Meows score distribution

Meows Score	Frequency (=n)	Percentage (%)
1	18	3.6
2	179	35.8
3	158	31.6
4	68	13.6
5	22	4.4
6	39	7.8
7	15	3.0
8	1	.2
Total	500	100.0

Majority of study participants had MEOWS score of two and three (35.8% and 31.6% respectively).

Table 4: Meows score group categorization

Group	Frequency (=n)	Percentage (%)
Low	355	71.0
Intermediate	90	18.0
High	55	11.0
Total	500	100.0

When cases were graded into groups based on MEOWS score, 355 cases (71%) were in Low group (<3 score) followed by 90 cases (18%) in Intermediate group (4-5 score) and 55 cases (11%) in High group (>5 score).

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Table 5: Duration of stay ≥7 days

Duration of stay	Frequency (=n)	Percentage (%)
More than 7 days	132	26.4
Less than 7 days	368	73.6
Total	500	100.0

Prolonged duration of stay for more than 7 days was observed in 26.4% of study participants.

Table 6: ICU Admission

ICU admission	Frequency (=n)	Percentage (%)
Required	89	17.8
Not required	411	82.2
Total	500	100.0

Among 500 cases, 89 cases (17.8%) were admitted to ICU.

Table 7: Blood transfusion

Blood transfusion	Frequency (=n)	Percentage (%)
Required	123	24.6
Not required	377	75.4
Total	500	100.0

Among 500 cases, 123 cases (24.6%) received blood transfusion.

Table 8: Blood products transfusion

Blood products transfusion	Frequency (=n)	Percentage (%)
NO	445	89.0
YES	55	11.0
Total	500	100.0

Among 500 cases, 55 cases (11%) received blood products transfusion.

Table 9: Morbidity score distribution

Morbidity score	Frequency (=N)	Percentage (%)
0	376	75.2
1	13	2.6
2	43	8.6
3	30	6.0
4	38	7.6
Total	500	100.0

Considering variables like prolonged duration of stay, ICU admission, transfusion of blood and blood products morbidity score was calculated. Score of zero was observed in majority of study participants (75.2%).

Table 10: Morbidity chances

Morbidity	Frequency (=N)	Percentage (%)
Had morbidity	124	24.8
No morbidity	376	75.2
Total	500	100.0

Among 500 cases, 124 cases (24.8%) had maternal morbidity.

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Table 11: Frequencies of continuous variables

	Age	Meows score	Duration of stay	Morbidity score
Mean	25.00	3.16	6.77	.68
Median	24.00	3.00	6.00	.00
Std. Deviation	4.606	1.423	2.408	1.290
Minimum	17	1	5	0
Maximum	42	8	22	4

Mean age of study participants was 25.00 $\pm$ 4.606 years ranging from 17 to 42 years. Mean duration of stay was 6.77 $\pm$ 2.40 days ranging from 5 to 22 days.

Table 12: Meows groups versus age distribution comparison

			Age group					Total
			17-20	21-25	26-30	31-35	36-42	
Meows groups	Low	N	66	153	91	38	7	355
		%	18.6%	43.1%	25.6%	10.7%	2.0%	100.0%
	Intermediate	N	9	42	23	11	5	90
		%	10.0%	46.7%	25.6%	12.2%	5.6%	100.0%
	High	N	8	31	11	5	0	55
		%	14.5%	56.4%	20.0%	9.1%	0.0%	100.0%
Total		Count	83	226	125	54	12	500
		%	16.6%	45.2%	25.0%	10.8%	2.4%	100.0%

CHI SQUARE = 11.520, P VALUE = 0.174 (NS)

As shown in the above table, there was no significant difference in distribution of different age groups between low, intermediate and high groups. On performing chi square test, this difference was not found to be statistically significant (P value >0.05).

Table 13: Meows group versus gravida comparision

			Gravida		Total
			Multi	Primi	
Meows Groups	Low	n	224	131	355
		%	63.1%	36.9%	100.0%
	Intermediate	n	50	40	90
		%	55.6%	44.4%	100.0%
	High	n	32	23	55
		%	58.2%	41.8%	100.0%
Total		n	306	194	500
		%	61.2%	38.8%	100.0%

CHI SQUARE = 1.957, P VALUE = 0.376 (NS)

As shown in the above table, there was no significant difference in distribution of multigravida and primigravida between low, intermediate and high groups. On performing chi square test, this difference was not found to be statistically significant (P value >0.05).

Table 14: Meows group versus duration >=7 days comparison

			Duration >=7 Days		Total
			No	Yes	
Meows groups	Low	n	318	37	355
		%	89.6%	10.4%	100.0%
	Intermediate	n	50	40	90
		%	55.6%	44.4%	100.0%
	High	n	0	55	55

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		%	0.0%	100.0%	100.0%
Total		n	368	132	500
		%	73.6%	26.4%	100.0%

CHI SQUARE = 215.055, P VALUE = 0.001 (S)

Prolonged duration of stay was observed in 10.4% in low group, 44.4% in intermediate group and 100% in high group. On performing chi square test this difference was found to be statistically significant (P value <0.05).

Table 15: Meows group versus ICU admission comparison

			ICU Admission		Total
			No	Yes	
Meows group	Low	n	345	10	355
		%	97.2%	2.8%	100.0%
	Intermediate	n	66	24	90
		%	73.3%	26.7%	100.0%
	High	n	0	55	55
		%	0.0%	100.0%	100.0%
Total		n	411	89	500
		%	82.2%	17.8%	100.0%

CHI SQUARE = 313.292, P VALUE = 0.001 (S)

ICU admission was observed in 2.8% in low group, 26.7% in intermediate group and 100% in high group. On performing chi square test this difference was found to be statistically significant (P value <0.05).

Table 16: Meows group versus blood transfusion comparison

			Blood Transfusion		Total
			No	Yes	
Meows group	Low	n	325	30	355
		%	91.5%	8.5%	100.0%
	Intermediate	n	50	40	90
		%	55.6%	44.4%	100.0%
	High	n	2	53	55
		%	3.6%	96.4%	100.0%
Total		n	377	123	500
		%	75.4%	24.6%	100.0%

CHI SQUARE = 221.732, P VALUE = 0.001 (S)

Blood transfusion was required in only 8.5% in low group, 44.4% in intermediate group and 96.4% in high group. On performing chi square test this difference was found to be statistically significant (P value <0.05).

Table 17: Meows group versus blood products transfusion

			Blood products Transfusion		Total
			No	Yes	
Meows group	Low	n	349	6	355
		%	98.3%	1.7%	100.0%
	Intermediate	n	81	9	90
		%	90.0%	10.0%	100.0%
	High	n	15	40	55
		%	27.3%	72.7%	100.0%
Total		n	445	55	500
		%	89.0%	11.0%	100.0%

CHI SQUARE = 245.58, P VALUE = 0.001 (S)

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Blood products transfusion was done in 1.7% in low group, 10% in intermediate group and 72.7% in high group. On performing chi square test this difference was found to be statistically significant (P value <0.05).

Table 18: Meows score versus morbidity assessment comparison

			Had morbidity		Total
			No	Yes	
Meows group	Low	n	326	29	355
		%	91.8%	8.2%	100.0%
	Intermediate	n	50	40	90
		%	55.6%	44.4%	100.0%
	High	n	0	55	55
		%	0.0%	100.0%	100.0%
Total		n	376	124	500
		%	75.2%	24.8%	100.0%

CHI SQUARE = 238.047, P VALUE = 0.001 (S)

Maternal Morbidity was observed in 8.2% in low group, 44.4% in intermediate group and 100% in high group. On performing chi square test this difference was found to be statistically significant (P value <0.05).

Table 19: Meows colour versus MEWT colour

		MEWT colour			Total
		Green	Red	Yellow	
Meows colour	Green	355	0	0	355
	Red	0	55	0	55
	Yellow	0	0	90	90
Total		355	55	90	500

Symmetric measures

		Value	P Value
Measure of Agreement	Kappa	1.000	.001

In our study we compared the effectiveness of MEOWS colour coding against MEWT colour coding to assess their efficacy as a screening tool in the routine use to predict maternal morbidity.

We found that both MEOWS colour coding and MEWT colour coding were matching in all the 500 cases in screening maternal morbidity (Kappa value of 1.00) and it was found to be statistically significant (P value <0.05).

Hence, we can use MEWT colour coding which is simple and easy to use with only 5 components in place of MEOWS colour coding which had 7 components as a bed side screening tool for the identification of early maternal warning signs by all healthcare professionals and thereby help in prevention of obstetric morbidity.

Discussion

Our study's objective is to clinically assess these antenatal and postpartum women using the MEOWS score and to foretell their risk of morbidity and mortality. The investigations necessary to score MEOWS were done as soon as the patient arrived at the emergency ward. These women were given the freedom to respond to treatment in a natural way, and the treatment plan was changed as and when it was necessary. Treatment-related events were recorded separately in the thesis proforma, analyzed, and the morbidity was recorded objectively.

Nearly 70% of the 500 women who participated in the study were patients. The patients

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ranged in age from 21 to 30. However, the teenage group's mothers made up a sizeable portion of the study group-16.6%-in significant numbers. This is in contrast to studies conducted in Europe and the United States, which revealed a much lower incidence of teenage pregnancies (Sedgh G *et al*., 2015) [7]. This is probably indicative of the low socioeconomic status and early marriage age that are prevalent in our nation, particularly in rural areas and urban slums. The fact that there are so many teenage mothers listed on the MEOWS chart may be because teenage pregnancies are associated with higher rates of morbidity and mortality.

Even though it is well known that older pregnant women can contribute to morbidity, in our study, only 2.4% of the study group's patients were over 35. This might be as a result of early family completion or the rising acceptance of the widespread sterilization programs in the nation.

Despite the fact that morbidity is more common in multigravidas, our study found no evidence of a relationship between maternal morbidity in primigravidas and multigravidas and MEOWS score. This could be as a result of the primigravida group having a higher proportion of teenage girls, who are more prone to complications and morbidity.

38.8% of our patients were primigravida, compared to 61.2% of multigravida patients. Patients with multigravida were in the second to sixth groups. Preeclampsia appears to be more frequent in young mothers and multigravida whose most recent childbirth occurred more than four years ago (Cormick G *et al*., 2016) [8]. Primigravidas were found to have a higher incidence of eclampsia.

The length of hospital stay (>=7 days), admission to the intensive care unit (ICU), blood transfusions, and the transfusion of blood products were all noted as factors affecting morbidity in this study.

While all patients with high MEOWS scores stayed for longer than a week, anywhere from 8 to 44 days, only about 10.4% of patients with low MEOWS scores spent longer than 7 days in the hospital. This shows that longer hospital stays are associated with higher MEOWS scores. Patients who received low MEOWS scores compared to those who received high scores experienced longer hospital stays, which is statistically significant. All patients with high MEOWS scores required ICU admissions for at least a brief period before being moved to the wards.

For the purpose of receiving immediate and critical care, 17.8% of the patients whose MEOWS charts triggered were admitted to the ICU. For patients who score highly on the MEOWS chart, this denotes the necessity of ICU. Only 2.8% of patients with low MEOWS scores and 100% of those with high scores needed to be admitted to the intensive care unit. In contrast, 26.7% of patients with intermediate scores and 100% of those with high scores did. This denotes that patients with high scores will need a lot of critical care. Nearly one-fourth of patients with intermediate MEOWS scores and all patients with high scores required admission to the ICU for a portion of their hospital stay. There was a significant statistical difference between those with low, intermediate, and high MEOWS scores and those who needed to be admitted to the intensive care unit. According to Tavares RC *et al*. (2008) and Hinton L *et al*. (2015), high scores and ICU admission had a positive correlation in earlier studies as well. Patients with GHTN made up the majority of those admitted to the ICU.

A small portion of patients who would have otherwise been voluntarily admitted to the ICU did not need ICU care if the MEOWS chart was used. This means that by preventing needless ICU admissions, the use of the MEOWS chart aids in resource optimization so as to maximize benefits from the limited resources available.

The MEOWS score can also be used as a triage tool to help prevent pointless ICU admissions when the risk of deterioration is low. 82.2% of our patients didn't need ICU assistance. Despite the fact that they triggered, all of the patients who did not need ICU admission had scores of low or intermediate on their MEOWS charts. All patients with high MEOWS scores needed intensive care unit treatment.

Anemia, postpartum hemorrhage, and abruption were the three main causes of blood transfusion in 24.6% of our patients. Due to conditions like abruption and post-partum

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hemorrhage progressing to DIC, blood products were needed in addition to blood for 11% of the patients. In addition, a high prevalence of anemia among expectant mothers in India is the main reason for this population's need for blood transfusions (Nair M *et al*., 2016) [11]. More than ten times as many patients with high MEOWS scores as those with low MEOWS scores needed blood transfusions.

Additionally, compared to 10% of patients with an intermediate MEOWS score and 1.7% of patients with a low score, 72.7% of patients with high MEOWS scores required blood product transfusion. In patients with high scores on the MEOWS chart, the need for blood as well as blood products was statistically significant.

The cumulative morbidity for patients with low meows scores was 8.2%; for patients with intermediate scores, it was 44.4%; and for patients with high scores, it was 100%. There was statistical significance to this. We can conclude from all of the calculations that the morbidity is higher the higher the MEOWS score. The sum of the following factors, including length of stay (>=7 days), ICU admission, and transfusion of blood and blood products, was used to calculate morbidity as a whole.

Based on numerical values, the MEOWS score was divided into low, intermediate, and high categories. A score of less than or equal to three was considered to be low. Scores between 4 and 5 were regarded as intermediate. A high score was anything over 5. According to this classification, prior studies have found a positive correlation between MEOWS score and morbidity (Jeffery *et al*., 2017) [12]. There was a significant relationship between maternal morbidity and MEOWS score classification in our study as well. Although the risk is higher if the numerical score was high, the majority of patients who trigger on the MEOWS chart experience some morbidity.

In our study we compared the effectiveness of MEOWS colour coding against MEWT colour coding to assess their efficacy as a screening tool in the routine use to predict maternal morbidity. We found that both MEOWS colour coding and MEWT colour coding were matching in all the 500 cases in screening maternal morbidity (Kappa value of 1.00) and it was found to be statistically significant (P value <0.05).

Conclusion

Prior to the disease process worsening and the patient deteriorating, the MEOWS score aids in the early detection of altered physiological parameters in pregnant mothers. This assists in identifying pregnant women who need specialized care and/or clinical intervention early on. Maternal mortality and morbidity are reduced to a greater extent by early detection of mothers with subclinical illness and prompt intervention. Being an objective measure of health status, the MEOWS score is a very trustworthy way to evaluate mothers both in the community and in hospitals. It is simple to train workers at the grass roots level in the peripheral health sectors and anganwadi workers to use the EWS for scoring, which then facilitates their referral to higher centers. By adding or removing parameters to make recording and scoring simpler, the MEOWS chart can be adjusted to fit the Indian situation. This will go a long way toward promoting the use of the MEOWS score in the neighborhood.

The MEOWS chart can be used repeatedly with hospitalized patients to evaluate the score, which can indicate patient improvement or deterioration and prompt care in the appropriate healthcare setting. It is possible to prevent unnecessary ICU admissions in patients with low chart scores, freeing up medical resources for patients who truly require them. Since the criteria used for scoring are unaffected by regional or cultural differences, MEOWS can be applied across the country without many modifications. A safe pregnancy and a healthy environment for the newborn are made possible by a decrease in maternal mortality, which also results in a decrease in neonatal mortality and morbidity.

We found that both MEOWS colour coding and MEWT colour coding were matching in all the cases in screening maternal morbidity. Hence, we can use MEWT colour coding which is simple and easy to use with only 5 components in place of MEOWS colour coding which had 7 components as a bed side screening tool for the identification of early maternal warning signs by all healthcare professionals and thereby help in prevention of obstetric morbidity.

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