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COMPARATIVE ASSESSMENT OF ADVERSE MATERNAL OUTCOME BETWEEN MODIFIED EARLY OBSTETRICS WARNING SYSTEM (MEOWS) AND STANDARD OF CARE GROUPS AMONG THE HIGH-RISK PREGNANT WOMEN: AN OBSERVATIONAL STUDY FROM BELAGAVI, KARNATAKA

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ABSTRACT **Background:** A trigger is defined as a single markedly abnormal observation or a combination of mildly abnormal observations. When a trigger is observed, it is expected that actions by the care team using a predefined protocol/algorithm will significantly reduce the risk of an adverse outcome. Physiological clinical observations such as vital signs are different in pregnant women compared to non-pregnant women as are abnormal thresholds. Modified early warning systems for the obstetric population have been advocated because they enable early detection of clinical deterioration, presenting an opportunity for timely actions to improve clinical outcome. **Objective:** To compare the adverse maternal outcome between Modified Early Obstetrics warning system (MEOWS) and Standard of care groups among the High-risk pregnant women. **Methodology:** The present study was carried out in Department of OBGY at KLES DR. PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE, BELAGAVI involving all high-risk pregnant women admitted i.e. 78 subjects in each group. **Results:** Distribution according to mode of delivery showed that 66.7% women from Group A and 66.7% from Group B underwent LSCS with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 9% women from Group A and 5.1% from Group B had perineal injury liquor with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 9% women from Group A and 5.1% from Group B had cervical tear liquor with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 25.6% women from Group A and 29.5% from Group B had morbidity with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 2.6% women from Group A and 1.3% from Group B had mortality with statistically no significant difference between two groups (p>0.05). **Conclusion:** With respect to risk factors, we observed statistically no significant difference between two groups (p>0.05). Major trigger was seen in MEOWs group with respect to blood pressure, colour of the liquor criteria and neural response.

KEYWORDS : *adverse maternal outcome, Modified Early Obstetrics warning system (MEOWS), Standard of care groups, High-risk pregnant women.*

INTRODUCTION

One of the main global issues is the high rates of maternal morbidity and mortality. Maternal mortality has been compared to the tip of an iceberg, with the overall morbidity of pregnancy and the postpartum period serving as the base.[1] Clinical severity ranges from mild to severe, with healthy pregnancies at one end and maternal death at the other. Across this continuum, there lies a degree of severe morbidity that corresponds to the concept of maternal near miss.[2] The World Health Organization (WHO) suggests using the phrase "maternal near miss" which more accurately portrays a woman who almost died but survived.

The World Health Organization (WHO) estimated 303, 000 maternal deaths globally in 2015 at the end of the Millennium Development Goals era.[3] Over 99% of these deaths occurred in low-income settings.[3] It is also estimated that there were 27 million episodes of direct obstetric complications annually that contribute to long-term pregnancy and childbirth com plications.[4] Good quality care including timely identification and management of obstetric complications can contribute to reducing the burden of maternal deaths and associated long term complications.[4]

Early Warning Systems comprise clinical observation charts and algorithms for triggering corrective action to improve clinical outcomes. Early warning systems have been used in non-obstetric specialties since 1997.[5] EWS combine clinical observations such as vital signs, clinical examination findings and laboratory tests to identify a pattern that is consistent with an increased risk of clinical deterioration.

A trigger is defined as a single markedly abnormal observation or a combination of mildly abnormal observations. When a trigger is observed, it is expected that actions by the care team using a predefined protocol/algorithm will significantly reduce the risk of an adverse outcome.[6] Physiological clinical observations such as vital signs are different in pregnant women compared to non-pregnant women as are abnormal thresholds.[7] Modified early warning systems for the obstetric population have been advocated because they enable early detection of clinical deterioration, presenting an opportunity for timely actions to improve clinical outcome.[8]

It is often observed that there was a period of slow and constant physiological decline in patients who had major ill ness or who passed away that went unrecognized and/or was handled improperly.[5] Therefore, the first early warning system (EWS) launched in 1997 for the adult non-obstetric population in the UK with the goal of recognizing patients at risk as early as possible.

OBJECTIVE:

To compare the adverse maternal outcome between Modified Early Obstetrics warning system (MEOWS) and Standard of care groups among the High-risk pregnant women.

MATERIALS AND METHODS

Study Setting:
Department of OBGY at KLES DR. PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE, BELAGAVI

Study Population:
All high-risk pregnant women admitted in KLES DR. PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE, BELAGAVI.

Study Period: one year

Study Design: Prospective observational study

Study Group: Modified Early Obstetrics Warning System (MEOWS)

Comparator Group: Standard of care

Sample size:
The required sample size was 78 subjects in each group.

Sampling Technique: All the eligible women will be selected consecutively by convenient sampling method.

Inclusion Criteria:
1.High risk pregnant women admitted in labour room

2.Antepartum women after 28 weeks of Gestational age

3.High risk Postpartum women up to 42 days.

Exclusion Criteria:
1.Women in active labour

2.Women who had uncomplicated normal delivery and caesarean

section.

3.Women who will be admitted directly to ICU.

4.Non consenting women.

Methods Of Data Collection:
All high risk antenatal and postnatal women visiting KLE Prabhakar kore hospital and medical research centre will be recruited in this study. They will be asked to enter the study only after they accept and sign the informed consent. The patients who satisfy the inclusion criteria and do not fall under exclusion criteria are recruited in the study. In MEOWS implemented group, MOEWS will be calculated at the time of admission based on values of the following variables: systolic blood pressure, diastolic blood pressure, respiratory rate, heart rate, oxygen saturation, temperature, and the level of consciousness. All the above parameters will be calculated and categorized according to scores and will be documented in colour coded MEOWS chart. This will guide the frequency of monitoring, need for, and urgency of clinical review.

A "TRIGGER" will be defined as a single markedly abnormal (1 red trigger) or 2 simultaneously mildly abnormal observations (2 amber triggers).

Data Collection Procedure:
Data will be collected using a structured proforma containing the following parameters.
- Demographic details of the mother
- Past obstetric and medical history
- Present obstetric history

MOEWS will be calculated based on values of the following variables: Systolic blood pressure, diastolic blood pressure, respiratory rate, heart rate, oxygen saturation, temperature, and the level of consciousness.

Blood pressure will be taken from manual sphygmomanometer, temperature with digital thermometer, oxygen saturation by Oximeter and with the help of Glasgow Coma Scale, level of consciousness will be evaluated. All these parameters will be documented on MEOWS chart and this will guide the frequency of monitoring, need for, and urgency of clinical review.

Statistical Analysis:
Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact test. Comparison of mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not.

A p value of <0.05 was considered as statistically significant whereas a p value <0.01 was considered as highly significant.

RESULTS

Table 1: Distribution According To Age Groups

		Group A		Group B		Total	p
		No	%	No	%		
Age group	<20	3	3.8	6	7.7	9	0.55
	21-30	59	75.6	56	71.8	115	
	31-40	15	19.2	16	20.5	31	
	>40	1	1.3	0	0.0	1	
Total		78	100.0	78	100.0	156	

Out of 78 cases from Group A, majority were from 21-30 years i.e. 75.6% followed by 19.2% from 31-40 years, 3.8% from less than 20 years and 1.3% from above 40 years age group. Out of 78 cases from Group B, majority were from 21-30 years i.e. 71.8% followed by 20.5% from 31-40 years, 7.7% from less than 20 years and 0% from above 40 years age group.

Table 2: Distribution According To Maternal Risk Factors

Maternal risk factors	Group A		Group B		Total	p
	No	%	No	%		
Preeclampsia	28	35.9	26	33.3	54	0.35
Eclampsia	5	6.4	3	3.8	8	0.73
HELLP Syndrome	5	6.4	5	6.4	10	1.0
Placenta previa	6	7.7	8	10.3	14	0.64
PAS	1	1.3	0	0.0	1	0.31
Abruption	5	6.4	2	2.6	7	0.24
Sepsis	1	1.3	3	3.8	4	0.31
Ruptured uterus	0	0.0	1	1.3	1	0.31
Cardiac disorder	7	9.0	8	10.3	15	0.78
Shock	2	2.6	1	1.3	3	0.56
PPH	13	16.7	11	14.1	24	0.89
Others	4	5.1	11	14.1	15	0.057

Distribution according to maternal risk factors showed that 35.9% women from Group A and 33.3% from Group B had preeclampsia with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 6.4% women from Group A and 3.8% from Group B had eclampsia with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 6.4% women from Group A and 6.4% from Group B had HELLP syndrome with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 7.7% women from Group A and 10.3% from Group B had placenta previa with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 1.3% women from Group A and 0% from Group B had PAS with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 6.4% women from Group A and 2.6% from Group B had abruption with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 1.3% women from Group A and 3.8% from Group B had sepsis with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 0% women from Group A and 1.3% from Group B had ruptured uterus with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 9% women from Group A and 10.3% from Group B had cardiac disorders with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 2.6% women from Group A and 1.3% from Group B had abruption with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 5.1% women from Group A and 14.1% from Group B had abruption with statistically no significant difference between two groups (p>0.05). Distribution according to maternal risk factors showed that 16.7% women from Group A and 14.1% from Group B had PPH with statistically non-significant difference between two (p>0.05).

Table 3: Distribution According To Mode Of Delivery

		Group A		Group B		Total	p
		No	%	No	%		
Mode of delivery	LSCS	52	66.7	52	66.7	104	1.0
	Vaginal	26	33.3	26	33.3	52	
Total		78	100.0	78	100.0	156	

Distribution according to mode of delivery showed that 66.7% women from Group A and 66.7% from Group B underwent LSCS with statistically no significant difference between two groups (p>0.05).

Table 4: Distribution According To Maternal Outcome

Maternal outcome	Group A		Group B		Total	p
	No	%	No	%		
Perineal injury	7	9.0	4	5.1	11	0.34
Cervical tear	7	9.0	4	5.1	11	0.34
Morbidity	20	25.6	23	29.5	43	0.51
Mortality	2	2.6	1	1.3	3	0.56

Distribution according to maternal outcome showed that 9% women from Group A and 5.1% from Group B had perineal injury liquor with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 9% women from Group A and 5.1% from Group B had cervical tear liquor with statistically no significant difference between two groups (p>0.05). Distribution according to maternal outcome showed that 25.6% women from Group A and 29.5% from Group B had morbidity with statistically no significant difference between two groups (p>0.05).

Distribution according to maternal outcome showed that 2.6% women from Group A and 1.3% from Group B had mortality with statistically no significant difference between two groups (p>0.05).

Table 5: Distribution According To Neonatal Outcome

Neonatal outcom	Group A		Group B		Total	p
	No	%	No	%		
Instrumentation required	11	14.1	9	11.5	20	0.22
MSL	12	15.4	7	9.0	19	0.51
Shoulder dystocia	6	7.7	4	5.1	10	0.34

Distribution according to neonatal outcome showed that 14.1% women from Group A and 11.5% from Group B required instrumentation with statistically no significant difference between two groups (p>0.05). Distribution according to neonatal outcome showed that 15.4% women from Group A and 9.0% from Group B had meconium-stained liquor with statistically no significant difference between two groups (p>0.05). Distribution according to neonatal outcome showed that 7.7% women from Group A and 5.1% from Group B had shoulder dystocia liquor with statistically no significant difference between two groups (p>0.05).

Table 6: Distribution Of The Cases According To Colour Coding In Group A

	White		Yellow		Red	
	No.	%	No.	%	No.	%
RR	69	88.5	9	11.5	0	0
SPO2	71	91.0	0	0	7	9.0
Temperature	69	88.5	4	5.1	5	6.4
HR	62	79.5	13	16.7	3	3.8
SBP	44	56.4	26	33.3	8	10.3
DBP	44	56.4	20	25.6	14	17.9
Proteinuria	46	59.0	26	33.3	6	7.7
Colour of liquor	66	84.6	0	0.0	12	15.4
Neural response	74	94.9	4	5.1	0	0
Lochia	64	82.1	14	17.9	0	0
General condition	63	80.8	15	19.2	0	0

We made cases stratification as per the colour coding as per respiratory rate criteria 11.5% had yellow colour and 0% had red colour grade, SPO2 criteria 0% had yellow colour and 9% had red colour grade, temperature criteria 5.1% had yellow colour and 6.4% had red colour grade, heart rate criteria 16.7% had yellow colour and 3.8% had red colour grade, SBP criteria 33.3% had yellow colour and 10.3% had red colour grade, DBP criteria 25.6% had yellow colour and 17.9% had red colour grade, proteinuria criteria showing 33.3% with yellow and 7.7% with red grade, colour of the liquor criteria showing 84.6% with white and 15.4% with red grade, neural response showing 94.9% with white and 5.1% with yellow grade, as per lochia criteria showing 17.9% with yellow and 0% with red grade, as per general condition criteria showing 19.2% with yellow and 0% with red grade.

DISCUSSION

Sociodemographic Profile Of The Study Population

We high high-risk pregnant women admitted in OBGY department and divided in two groups and included 78 patients in each group as follows: Study group (Group A): Modified Early Obstetrics Warning System (MEOWS). Comparator group (Group B): Standard of care.

Out of 78 cases from Group A, majority were from 21-30 years i.e. 75.6% followed by 19.2% from 31-40 years, 3.8% from less than 20 years and 1.3% from above 40 years age group. Out of 78 cases from Group B, majority were from 21-30 years i.e. 71.8% followed by 20.5% from 31-40 years, 7.7% from less than 20 years and 0% from above 40 years age group. Mean age of the women from Group A and Group B was 26.58±5.14 and 27.41±4.74 years with statistically no significant difference between two groups (p>0.05).

Singh A. et al[9] **"**in their study reported that the they included completed MEOWS chart of 1065 study subjects was analysed. Study population was largely comprised of antenatal (98%), young females between 20–30 years of age belonging to either lower or middle socio-economic status. About two-third of the women had regular antenatal visits and 85% of the admissions were direct."

Distribution according to socioeconomic status revealed that from Group A, majority were from middle SES i.e. 34.6% followed by 30.8% from lower SES, 15.4% from lower middle, 11.5% from upper middle and 7.7% from upper SES. Group B, majority were from middle SES i.e. 33.3% followed by 24.6% from lower SES, 16.7% from lower middle, 15.4% from upper middle and 10.3% from upper SES. We observed statistically no significant difference in the number of women from each category of SES.

Singh A. et al[9] **"**in their study reported that 14.43% women from triggered group and 9.21% from non-triggered group belonged from lower SES, 36.26% women from triggered group and 37.77% from non-triggered group belonged from upper lower SES, 37.67% women from triggered group and 39.43% from non-triggered group belonged from lower middle SES, 11.61% women from triggered group and 13.57% from non-triggered group belonged from upper middle SES.

Ibáñez-Lorente C et al[10] stated that, "there rate of caesarean delivery and instrumental delivery of 23.2% and 15.1%, respectively. "

Singh A. et al[9] **"**in their study reported that associated obstetric condition was present in 22% of cases with hypertensive disorders (9.8%) being commonest followed closely by previous caesarean section (7.7%). Associated medical condition was present in 5% of cases; severe anaemia (2.4%) being the commonest. "

Radha R. et al[11] observed that, "96 cases were preeclamptic, 45 cases had PPH, 19 cases had PPH with preeclampsia, 15 cases were found to have eclampsia, and 2 of these cases with eclampsia developed cortical venous thrombosis (CVT). Wound infection was found in nine cases, three cases had pulmonary edema, and pulmonary thromboembolism was found in one case. "

Ibáñez-Lorente C et al[10] stated that, "the protocol was triggered in 75 patients (6.43%). Patients who triggered the protocol had a higher rate of caesarean delivery (37.3% vs 22.3%, p = 0.005), preeclampsia (17.3% vs 4.8%, p < 0.001), and multiple birth (6.7% vs 1.5%). The PFD rate was also higher (14.7% vs 2.6%, p < 0.001), as was the CCU admission rate (12% vs 0.8%, p < 0.001) and length of stay [median: 2.9 (2.3–3.6) vs 2.5 (2.1–3.1) days, p =0.005]. Fifteen patients underwent surgery in the first 2 hours after delivery, fourteen of them for uncontrolled vaginal bleeding that required obstetric curettage. One patient had to undergo emergency hysterectomy. "

Maternal Outcome

Distribution according to liquor colour showed that 15.4% women from Group A and 5.1% from Group B had green colour with statistically significant difference between two groups (p<0.05) showing more number of cases with green liquor from Group A.

Distribution according to neural response showed that 94.9% women from Group A and 98.7% from Group B were alert, 5.1% women from Group A and 0% from Group B responded to verbal stimuli, 0% women from Group A and 1.3% from Group B were unresponsive to response with statistically no significant difference between two groups (p>0.05).

Radha R. et al[11] observed that, "neurological score of the examined cases. About 98% of cases were neurologically normal and < 2% of cases were found to have neurological instability."

Distribution according to lochia pattern showed that 17.9% women from Group A and 12.8% from Group B had heavy lochia with statistically no significant difference between two groups (p>0.05).

Colour Coding

We made cases stratification as per the colour coding as per respiratory rate criteria 11.5% had yellow colour and 0% had red colour grade, SPO2 criteria 0% had yellow colour and 9% had red colour grade, temperature criteria 5.1% had yellow colour and 6.4% had red colour grade, heart rate criteria 16.7% had yellow colour and 3.8% had red colour grade, SBP criteria 33.3% had yellow colour and 10.3% had red colour grade, DBP criteria 25.6% had yellow colour and 17.9% had red colour grade, proteinuria criteria showing 33.3% with yellow and 7.7% with red grade, colour of the liquor criteria showing 84.6% with white and 15.4% with red grade, neural response showing 94.9% with white and 5.1% with yellow grade, as per lochia criteria showing 17.9% with yellow and 0% with red grade, as per general condition criteria showing 19.2% with yellow and 0% with red grade.

Singh A. et al[9] **"**in their study reported that two hundred and eighty-four (26.60%) women triggered to abnormal zones after admission.**"**

Singh A. et al[9] **"**in their study reported that among individual physiological parameters, the most frequent trigger was high diastolic blood pressure (33%). This was followed by heart rate (19.3%), abnormal liquor (7.23%), high systolic blood pressure (5.19%) and respiratory rate (2.06%) respectively. Abnormal value in either yellow or red zone leads to significant increase in morbidity."

Radha R. et al[11] observed that, "eighty-two cases showed only elevated blood pressure, 53 cases showed tachycardia, 5% (48) of cases showed elevation of both blood pressure and pulse rate, two cases showed abnormal renal parameters, abnormal blood pressure, abnormal HR, and abnormal RR, two cases showed abnormal renal parameters, abnormal blood pressure, and abnormal HR, two cases showed abnormal blood pressure and abnormal RR, and two cases showed abnormal blood pressure and abnormal RR. Twelve cases showed elevation of blood pressure, HR, and RR. Only one case showed elevated temperature, abnormal blood pressure, and abnormal HR."

CONCLUSION:

With respect to risk factors, we observed statistically no significant difference between two groups ($p>0.05$). Major trigger was seen in MEOWs group with respect to blood pressure, colour of the liquor criteria and neural response. Childbirth is a major life event and the physiological and psychological implications of serious illness on the woman and her family cannot be dismissed. While midwives strive to encourage and support normality for pregnant and postnatal women, equal importance must be assigned to identifying and acting on physiological changes occurring in women, which may indicate illness that without timely intervention can lead to significant maternal morbidity. A modified early obstetric warning tool provides a useful aid to clinical judgement during the assessment process and a structure to follow which should ensure timely and appropriate intervention when required.

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