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Result of adherence to the modified early obstetric warning system to prevent morbidity and mortality from sepsis

Resultado da adesão ao sistema de alerta obstétrico precoce modificado para prevenir morbimortalidade por sepse

Resultado de la adherencia al sistema modificado de alerta obstétrica temprana para prevenir la morbilidad y mortalidad por sepsis

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ABSTRACT

Objective: to analyze the contribution of adherence to a modified early obstetric warning system for the prevention of morbidity and mortality due to sepsis in pregnant women. **Method:** quantitative, documentary, retrospective study, using data from the medical records of pregnant women undergoing obstetric screening with sepsis criteria. Data were collected using structured forms, tabulated, and analyzed using descriptive statistics. The Research Ethics Committee approved the research protocol. **Results:** according to data from 105 pregnant women, signs of sepsis were identified using the Modified Early Obstetric Warning System in 47.3% of cases. Based on the early identification of sepsis, the sepsis bundle was opened by obstetric nurses in 100% of cases. **Conclusion:** it is evident that adherence to the Modified Early Obstetric Warning System based on evidence of triggers, bundles, and protocols can help in timely diagnosis and treatment to prevent or limit the severity of sepsis morbidity in pregnant women, as well as facilitate patient-centered interdisciplinary care.
Descriptors: Obstetric Nursing; Pregnancy; Risk Assessment; Sepsis, Clinical Protocols.

RESUMO

Objetivo: analisar a contribuição da adesão de um sistema de alerta obstétrico precoce modificado para a prevenção da morbimortalidade por sepse em gestantes. **Método:** estudo quantitativo, documental, retrospectivo, com dados de prontuários de gestantes atendidas na triagem obstétrica com critérios de sepse. Dados coletados utilizando formulários estruturados, tabulados e analisados por estatística descritiva. Protocolo de pesquisa aprovado pelo Comitê de Ética em Pesquisa. **Resultados:** segundo dados de 105 gestantes, houve identificação dos sinais de sepse com o uso do *Modified Early Obstetric Warning System* em 47,3% dos casos. A partir da identificação precoce da sepse, foi aberto o *bundle* de sepse por enfermeiras obstetras em 100% dos casos. **Conclusão:** evidencia-se que a adesão ao *Modified Early Obstetric Warning System* baseada em evidências de gatilhos, *bundle*s e protocolos pode ajudar no diagnóstico e tratamento oportunos para prevenir ou limitar a gravidade da morbidade da sepse em gestantes, bem como facilitar o atendimento interdisciplinar centrado no paciente.
Descritores: Enfermagem Obstétrica; Gravidez; Classificação de Risco; Sepse, Protocolos Clínicos.

RESUMEN

Objetivo: analizar la contribución de la adherencia a un sistema modificado de alerta obstétrica temprana a la prevención de la morbilidad y la mortalidad por sepsis en embarazadas. **Método:** este es un estudio cuantitativo, documental y retrospectivo con datos de las historias clínicas de mujeres embarazadas sometidas a triaje obstétrico basado en criterios de sepsis. Los datos se recolectaron mediante formularios estructurados y tabulados y se analizaron mediante estadística descriptiva. El protocolo de investigación fue aprobado por el Comité de Ética en Investigación. **Resultados:** según los datos de 105 mujeres embarazadas, se identificaron signos de sepsis en el 47,3% de los casos al utilizar el *Modified Early Obstetric Warning System*. Una vez que se identificó tempranamente la sepsis, las enfermeras obstétricas iniciaron el *bundle* en el 100% de los casos. **Conclusión:** se observó que la adherencia al *Modified Early Obstetric Warning System,* basada en la evidencia de desencadenantes, *bundles* y protocolos, puede contribuir al diagnóstico y tratamiento oportunos para prevenir o limitar la gravedad de la morbilidad por sepsis en mujeres embarazadas, y a facilitar la atención interdisciplinaria centrada en el paciente.
Descriptores: Enfermería Obstétrica; Embarazo; Medición de Riesgo; Sepsis, Protocolos Clínicos.

INTRODUCTION

Maternal mortality remains a major global public health challenge, reflecting socioeconomic inequalities, limited access to health services, and weaknesses in qualified obstetric care. Estimates from the World Health Organization (WHO) indicate that in 2020, approximately 287,000 women died from causes related to pregnancy, childbirth, or the postpartum period, with maternal sepsis responsible for approximately 10% of these deaths[1]. Sepsis is a serious clinical

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condition characterized by organ dysfunction secondary to the body's dysregulated response to infection, and has a rapid and lethal progression if not recognized and treated early[2,3].

Sepsis during pregnancy and childbirth has physiological and clinical specificities that make early diagnosis difficult, as many changes considered pathological in the general clinical context may be physiological during pregnancy. This scenario requires specific approaches and targeted protocols that allow for early detection of signs of clinical deterioration. Therefore, it is essential to implement early warning systems that allow for the rapid detection of abnormalities in maternal vital signs[4,5].

In this context, the Modified Early Obstetric Warning System (MEOWS) stands out, a score adapted from the Early Warning Score (EWS) tool, originally developed for the general adult population, but later modified to meet the physiological particularities of pregnancy[8-10].

MEOWS was validated in the United Kingdom in 2007 and has become widely recommended by international bodies, such as the Royal College of Obstetricians and Gynaecologists (RCOG), for the continuous clinical surveillance of women during pregnancy, childbirth, and the puerperium[6,7]. Studies demonstrate that the systematic adoption of MEOWS contributes significantly to the reduction of maternal morbidity and mortality by enabling timely interventions based on the early detection of clinical deterioration[8-10].

In Brazil, although still in the process of widespread implementation, the use of MEOWS has been incorporated into some obstetric services, associated with the Reception and Risk Classification (*Acolhimento com Classificação de Risco*, A&CR) protocol, where obstetric nurses play a central role in screening, assessment, and initial clinical decision-making. The use of this tool by nursing professionals, especially in the context of the Unified Health System (*Sistema Único de Saúde*, SUS), strengthens the protagonism of the category on the front line of care and optimizes the clinical response in risk situations[11,12].

Despite these advances, there is a lack of national studies that systematically evaluate adherence to MEOWS, its clinical impact, and maternal outcomes resulting from its implementation. Furthermore, few studies discuss the integration of MEOWS with the recommended intervention packages in sepsis bundles and the impact of this synergy on reducing maternal mortality.

Therefore, this study is justified by the clinical and epidemiological relevance of maternal sepsis, the need to improve mechanisms for early recognition of the condition, and the importance of strengthening evidence-based practices in obstetric care.

Thus, the present study aims to analyze the contribution of adherence to a modified obstetric early warning system (MEOWS) for the prevention of morbidity and mortality due to sepsis in pregnant women.

METHOD

This is a quantitative, documentary, retrospective study. The study description adhered to the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Data were collected through electronic medical records from August 2022 to December 2022, in the obstetric triage of a reference hospital for high-risk pregnancies, which is part of the Unified Health System (*Sistema Único de Saúde*, SUS), located in Recife, Pernambuco, Brazil.

For data collection, the Center for Information Technology (CIT) of the institution involved was asked to provide a list of patients seen in obstetric screening who had a record of the sepsis protocol checklist in their electronic medical records, totaling a population of 177 women in the gynecological and obstetric context.

After analyzing the criteria, 105 medical records of pregnant women without clinical signs of labor and who met the criteria for sepsis, treated between January 2021 and July 2022, were included. Seventy-two medical records with incomplete or incorrectly filled information were excluded. This time frame was chosen because it was a period marked by high rates of maternal mortality from preventable causes, raising local and national epidemiological indicators and indicating the need for research to define strategies to reduce these indicators.

A structured form prepared by the research team was used as an instrument, which included clinical-epidemiological and demographic variables, including age, race/color, education, origin, pregnancies, parities, gestational age, vital signs, infectious focus, Modified Early Obstetric Warning System (MEOWS) score, collection or not of blood cultures before administration of intravenous antibiotic therapy, time elapsed until administration of the antibiotic to the patient, admission to the Intensive Care Unit (ICU) and gestational outcomes.

Early detection of maternal sepsis signs will be recorded using the MEOWS score, which consists of assigning values from 0 to 3 to four vital signs (Temperature, Systolic Blood Pressure, Diastolic Blood Pressure, Pulse, Respiratory rate,

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level of consciousness, and cardiac output). A score greater than or equal to four triggers a "cascade of actions", providing specific instructions on the level of monitoring and directing the initiation of the SEPSIS protocol.

Data analysis was performed by constructing a database organized and stored in a Microsoft Excel spreadsheet, used to code the variables. The results were presented in tables using descriptive statistics.

The research protocol followed the ethical principles of Resolution No. 466/12 of the National Health Council and was approved by the Research Ethics Committee of the proposing institution. The data from this study are considered joint property of the parties involved. The information obtained related to these patients was used solely and exclusively in this research, without individual identification of their names.

RESULTS

Based on data from 105 medical records of pregnant women who met sepsis criteria during obstetric risk classification, it was found that the majority self-identified as brown (68%), were aged 23 to 31 years (51%), and were from the city of Recife (43%). Regarding obstetric data, the majority were multiparous (68%), with an average of 2.6 pregnancies, and were in the third trimester of pregnancy (43%).

The complaints reported by pregnant women and the clinical signs are presented in Table 1.

Table 1: Signs and symptoms of pregnant women with sepsis criteria (n=105). Recife, PE, Brazil,2022.

Variables		n (%)
Main complaint (n=171)	Low back pain	52 (30.4)
	Lower abdominal pain	39 (22.8)
	Dysuria	33 (19.3)
	Increased body temperature	16 (9.4)
	Flank pain	6 (3.5)
	Vaginal bleeding	6 (3.5)
	Nausea and vomiting	5 (2.9)
	Pollakiuria	4 (2.3)
	Fluid loss	3 (1.7)
	Cough	2 (1.2)
	Chills	1 (0.6)
	Dyspnea	1 (0.6)
	Precordial pain	1 (0.6)
	Dyspnea	1 (0.6)
	Hematuria	1 (0.6)
VS (n=105)		
Blood Pressure	Normotensive	80 (76.1)
	Hypotension	11 (10.5)
	Hypertension	14 (13.3)
Heart Rate	Tachycardia	92.4 (88)
	No record	5 (4.76)
	Normocardia	7.6 (7.2)
Respiratory rate	Eupnea	77 (73.3)
	Tachypnea	22 (20.9)
	No record	6 (5.7)
AT	Afebrile	78 (74.3)
	Feverish	22 (20.9)
	No record	5 (4.8)

Legend: VS - vital signs; AT - axillary temperature

Low back pain was the most reported symptom (30.4%), followed by lower abdominal pain (22.8%), dysuria (19.3%), increased body temperature (9.4%), vaginal bleeding (3.5%), and flank pain (3.5%). Vital signs measured included tachycardia (92.4%), tachypnea (20.9%), fever (20.9%), and hypotension (10.5%) with systolic blood pressure below 90 mmHg.

The score obtained from the analysis using the Modified Early Obstetric Warning System (MEOWS) score.

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Table 2. MEOWS score associated with vital signs. Recife, PE, Brazil, 2022.

MEOWS Score	n (%)
≥4	38 (34.5)
=3	26 (23.6)
≤2	25 (22.7)
≥6	15 (13.6)
3 in one of the parameters	5 (4.5)
Null	1 (0.9)
Total	**110 (100)**

Most early identification of sepsis warning signs was detected through MEOWS, accounting for 52.6% of cases, based on a score greater than or equal to four, and 4.5% with a total of three points in two parameters. The remainder were identified by symptoms reported by pregnant women.

A null score is used for pregnant women who are in labor during the risk classification, as the physiological changes during this period may interfere with the score, so it is canceled in order to not generate a false alert.

Thus, if MEOWS is altered, followed by the question "can I rule out infection?", with the answer "no", it is necessary to activate the SEPSIS bundle. The data showed that in 100% of cases, the sepsis bundle was opened by obstetric nurses. Among the steps of the protocol performed, in 97.1% of cases lactate was collected, 98.1% collected blood culture, 94.3% administered antibiotic therapy, and 51.4% performed hydration. Subsequently, 97.1% of pregnant women were admitted for clinical follow-up.

Table 3 shows the follow-up of pregnant women with sepsis criteria after screening by obstetricians.

Table 3: Clinical conduct and outcomes of pregnant women after early identification of sepsis. Recife, PE, Brazil, 2022.

Variables		n (%)
Medical conduct (n=105)	Admission to the obstetric ward	53 (50.5)
	Admission to the obstetric center	36 (34.3)
	Admission to the ICU	12 (11.4)
	Discharge	3 (2.9)
	Admission to the respiratory isolation unit	1 (0.9)
Outcomes (n=43)	PROM	27(62.8)
	Preterm labor	5(11.6)
	Evasion	3(6.9)
	Terruption of pregnancy	7(16.8)
	Death	1(2.3)

Legend: PROM - Premature Rupture of Ovular Membranes; ICU - Intensive Care Unit.

It was observed that 50.5% were stable and continued treatment in the obstetric ward, 34.3% were referred to the obstetric center, requiring continuous monitoring, and 11.4% who were in serious condition, were referred to the ICU; only 0.9% required respiratory isolation.

Among the outcomes presented during the hospitalization process of pregnant women admitted with sepsis criteria, the majority of patients who presented urinary tract infection developed Premature Rupture of Ovular Membranes (PROM) during hospitalization (41.5%). One death was identified among the pregnant women, but due to other underlying clinical conditions.

DISCUSSION

The findings of this study demonstrate low uptake of the modified obstetric early warning system (MEOWS), reflecting the gap between the incorporation of care technologies and their effective consolidation in care practice. This finding is consistent with international studies that highlight obstacles to implementing clinical monitoring tools in hospital settings, especially in low- and middle-income countries[1,13].

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MEOWS is widely recommended as an effective strategy for early detection of clinical deterioration in women during pregnancy and childbirth. Evidence from the United Kingdom, where the system was developed, indicates that its systematic application has led to a reduction in serious adverse events and improved institutional clinical responses[5,12]. Countries like Australia and Canada have also demonstrated significant benefits from incorporating MEOWS, especially when combined with periodic training, clinical audits, and standardized rapid response protocols[13,14].

However, in low- and middle-income countries, such as many in Latin America and Sub-Saharan Africa, the implementation of MEOWS has faced significant challenges. In these contexts, factors such as team workload, deficiencies in continuing education, and flaws in the institutional safety culture hinder the consolidation of effective clinical monitoring practices. Furthermore, human resource shortages, fragmented health systems, and the absence of clinical governance policies contribute to inefficient responses to obstetric emergencies[15].

In Brazil, despite structural policies such as the *Rede Cegonha* and the *Estratégia Qualineo* aimed at improving obstetric and neonatal care, maternal mortality rates remain worrying, with preventable causes such as sepsis among the main factors. In this context, the use of MEOWS appears to be a promising tool, but its effectiveness depends on team adherence, clear institutional workflows, and the existence of clinical protocols linked to the rapid response system[16].

The data from this study suggest that low adherence to MEOWS may be associated with a lack of regular training, staff turnover, weak interprofessional communication, and a lack of an organizational culture focused on clinical surveillance. This scenario is similar to that found in obstetric units in South Africa, where, even with the introduction of early warning systems, the lack of ongoing training compromised their effective implementation[17].

From a theoretical perspective, MEOWS aligns with the obstetric surveillance model proposed by the World Health Organization, which emphasizes early identification of clinical signs of deterioration and rapid response based on care protocols. Its effectiveness, however, lies not only in the tool itself, but in a set of organizational practices that involve continuous surveillance, team training, professional empowerment, and a functional clinical governance system[1,18].

Furthermore, it's important to emphasize that early warning systems must be adapted to local realities, respecting the institutional and epidemiological specificities of each region. Standardizing scales without proper contextualization can lead to underutilization or inappropriate use of the tool, as already demonstrated by studies conducted in hospitals in Latin America. Therefore, adapting MEOWS to local realities, without losing its essence, is crucial for its effectiveness[16].

In this sense, the local findings of this study, although embedded in a specific context, have broad national and international relevance, as they reflect a common problem for health systems seeking to improve obstetric care: the transition between knowledge and practice. By highlighting the gap between the tool's existence and its practical application, this study contributes to the global debate on the effectiveness of strategies to prevent maternal morbidity and mortality and reinforces the urgent need for policies to strengthen a culture of safety in maternal health.

Study limitations

The limitations to be considered in the study refer to the lack of sociodemographic and obstetric information that was not found in the medical records, as well as the prenatal history, which reveals the risk factors and vulnerabilities that increase the risks of maternal mortality. It is necessary to identify the social, economic, reproductive, and healthcare conditions that influence delays in interventions aimed at improving healthcare and reducing maternal deaths.

CONCLUSION

The study data demonstrate the relevance of using a specific score for the obstetric population, MEOWS, for early detection of clinical signs of sepsis. The trigger score proved effective in alerting professionals to the need to quickly initiate the cascade of actions contained in the sepsis bundle, which had a direct impact on reducing morbidity and mortality in pregnant women.

Furthermore, it has implications for the advancement of scientific knowledge in the health and nursing field, as its results demonstrate the relevance of adhering to the application of MEOWS in nursing practices, as it is a tool capable

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of quickly identifying clinical severity and favoring alerting the multidisciplinary team, allowing effective interventions to prevent unfavorable obstetric outcomes.

Thus, it is demonstrated that adherence to the use of MEOWS, based on evidence of triggers, bundles, and protocols, can aid in timely diagnosis and treatment to prevent or limit the severity of sepsis morbidity in pregnant women, as well as facilitate patient-centered interdisciplinary care. To this end, it is pertinent to disseminate this topic to the scientific community, in addition to its use in the ongoing education of healthcare teams in high-risk maternity wards to ensure the implementation and use of these safety tools.

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Author's contributions

Conceptualization, M.M.M. and J.D.S.S.L.; methodology, M.M.M. and J.D.S.S.L.; validation, J.D.S.S.L. and A.A.P.S.; formal analysis, M.M.M., J.D.S.S.L. and A.A.P.S.; data curation, M.M.M., J.D.S.S.L. and manuscript writing, M.M.M.; review and editing, K.F.F.L.F., N.A.S.S., LSO, LCGBSA e LHRS; vizualization, K.F.F.L.F., N.A.S.S., LSO, L.C.G.B.S.A. and L.H.R.S.; supervision, A.A.P.S.; project administration, A.A.P.S. All authors read and agreed with the published version of the manuscript.

Use of artificial intelligence tools

Authors declare that no artificial intelligence tools were used in the composition of the manuscript "*Result of adherence to the modified early obstetric warning system to prevent morbidity and mortality from sepsis*".