



## ORIGINALES

### Signs of life in the morbidity of pregnant women

Signos de vida en la morbilidad de la gestante

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#### ABSTRACT:

For the assessment of pregnant women, it is essential for nursing and medical staff to incorporate parameters to identify alterations in antenatal health status. This health care assessment is not performed by all institutions that provide antenatal care to pregnant women. Performing antenatal health care assessment assists in the early detection of clinical alterations that can increase morbidity and maternal mortality. The study aims to determine the alterations in pregnant women with the application of the Early Warning Scale in a highly complex institution in Colombia.

**Method:** This research is observational, descriptive, and was carried out on 308 pregnant women who were hospitalized or admitted in a Special Obstetric Care Unit (SOCU) for more than one day in a highly complex institution. Data contained in digital medical records were collected and evaluations were carried out by healthcare staff between January 2017 and December 2017, by way of an overall format for health conditions and the Early Warning Scale.

**Results:** The age of pregnant women ranged between 14 and 45 years. The most common diagnosis for admission was preeclampsia with 38.2% CI 95% (32.62–43.98). The highest frequency of alterations was found in systolic blood pressure with 70.1% Confidence Interval (CI) 95% (50.75–62.07), diastolic blood pressure 56.5% CI 95%(50.75–62.07), and respiratory distress 28.9% CI (23.97–34.36). Statistical significance was found between hospital stay and pathological history with  $p < 0.03$ . Timely assessment, diagnosis, and registration procedures by nurses and medical staff are of vital importance in the early detection of extreme maternal morbidity.

**Keywords:** pregnancy, morbidity, rapid assessment, obstetric nursing

#### RESUMEN:

Para la valoración de las gestantes es indispensable incorporar parámetros que permitan la identificación de alteraciones de parte del personal de enfermería y medicina. Esta valoración en la atención de salud no se realiza en todas las instituciones en las cuales consultan las gestantes, llevarlo a cabo permite detectar a tiempo las alteraciones clínicas que incrementan la morbilidad y la mortalidad materna. El estudio determina las alteraciones en gestantes cuando se aplica la Escala de Alerta Temprana en una institución de alta complejidad en Colombia.

**Método:** Investigación observacional descriptiva, en 308 gestantes con más de un día de encontrarse en hospitalización y unidad de cuidados especial obstétrico, recolectando información contenida en las historias clínicas digitales y las evaluaciones realizadas por el personal de salud durante el periodo enero a diciembre del 2017, a través de un formato general de condiciones de salud y la escala de alerta temprana en una institución de alta complejidad.

**Resultados:** La edad de las gestantes se encuentra entre 14 y 45 años. El diagnóstico más frecuente de ingreso fue preclampsia con un 38.2% IC95% (32.62-43.98). La mayor frecuencia de alteraciones está en la tensión arterial sistólica con un 70.1% IC95% (50.75-62.07), tensión diastólica 56.5% IC 95% (50.75-62.07) y alteración respiratoria 28.9% IC (23.97-34.36). Se encontró significancia estadística entre la estancia y los antecedentes patológicos con  $p < 0.03$ . Los procedimientos de valoración, diagnóstico y registro oportuno por el personal de enfermería y médico son de vital importancia en la detección precoz de la morbilidad materna extrema.

**Palabras clave:** Embarazo, morbilidad, evaluación rápida, enfermería obstétrica

## INTRODUCTION

The World Health Organization <sup>(1)</sup> links the deaths of 303,000 people in 2015 to women during pregnancy, birth, or the period after these events; most of these avoidable deaths occurred in lower income group patients. Quality care and timely identification of alterations can reduce the maternal mortality rate and long-term complications <sup>(2)</sup>.

Obstetric Early Warning Systems are part of a group of clinical tools <sup>(3)</sup> that were designed to improve patient safety by assessing parameters such as temperature, respiratory rate, heart rate, blood pressure, neurological status, and oxygen saturation; enabling timely interventions based on evidence. The tool promotes interdisciplinarity and assists with timely diagnosis and treatment to prevent or limit the severity of morbidity and reduce maternal morbidity.

Sing et al.<sup>(4)</sup>, evaluated the parameters of the Early Warning Scale in the obstetric population finding that Maternity Early Obstetric Warning Scoring System (MEOWS) was 89% sensitive [95% Confidence Interval (CI): 81–95%], 79% specific (95% CI: 76–82%), with a positive predictive value of 39% (95% CI: 32–46%) and a negative predictive value of 98% (95% CI: 96–99%). Paternina et al. <sup>(5)</sup>, conducted a study to predict death using the Early Warning Scale in the obstetric population of the intensive care unit (ICU) finding an accuracy of death of 0.84 (95% CI: 0.75–0.92%) In the general obstetric population, the Early Warning System has been shown to have a sensitivity to predict admission to the ICU of 96.9% and a specificity of 99.9%, a positive prediction of 12% and a negative prediction value of 99.99% <sup>(6)</sup>.

According to the recommendation of the American College of Obstetricians, the use of the Early Warning Systems in all Obstetric Care Hospitals in New York <sup>(7)</sup> were approved. The UK report <sup>(8)</sup> found that the three most common reasons for potentially avoidable mortality in UK hospitals were the poor management of clinical deterioration (35%), the lack of prevention (26%), and poor supervision checks (10%), which includes the monitoring of vital signs.

## OBJECTIVE

To determine the alterations in pregnant women when the Early Warning Scale is applied during hospitalization and at a Specialist Obstetric Care Unit at a highly complex institution in Colombia.

## MATERIAL AND METHODS

### Research design

In this descriptive observational study, the population consisted of pregnant women who attended a Health Services Provider Institution in Cali-Colombia between January 2017 and December 2017, who were affiliated with a State Social Enterprise and belonged to the contributory regime. For the calculation of sample size, a confidence level of 95% and a margin of error of 5% were considered, which thereby provided, 204 pregnant women from the hospitalization service and 104 from the Special Obstetric Care Unit (SOCU). The selection was made through systematic probability sampling with replacement. The selection criteria included pregnant women who were admitted to the hospital for more than one day and who stayed inpatient until being discharged from the gynecology service, i.e., hospitalization and SOCU. The pregnant women who were referred to another institution during hospitalization were excluded.

The variables included maternal age (years), gestational age (weeks), parity, date of admission and discharge, diagnosis at the time of admission and discharge, Early Warning Scale vital parameters (temperature, systolic and diastolic blood pressure, heart rate, respiratory rate, oxygen saturation, and state of consciousness), pain score, pathological history, and obstetric history.

The Early Warning Scale (4) (5) was used, which has a MEOWS overall sensitivity to predict morbidity, this was 89% (95% CI: 81–95%), 79% specificity (95% CI: 76–82%), and negative predictive value 98% (CI 95% 96–99%). The measured values of each of the parameters on the Early Warning Scale are as follows: temperature (degree Celsius) in red 35°C and 38°C to 40°C for systolic blood pressure mmHg (millimeters of mercury) the parameter in red was from 50–80 mmHg and 100–200 mmHg, in yellow 90–100 mmHg and 140–150 mmHg; for diastolic blood pressure mmHg in red 40 mmHg and 100–110 mmHg, in yellow 50–90 mmHg; for heart rate (beats per minute) the parameter in red <40 beats/minutes and 120–130 beats/minute, in yellow 50 beats per minute and 100–110 per minute; for the respiratory rate in red it was 0–15 breaths per minute and 25–30 breaths per minute, in yellow 21–24 breaths per minute; for oxygen saturation in red it was <95%; neurological state giving red to pain and to no response, yellow to verbal answer, red for pain scale from 7 to 10 (High), yellow from 4–6 (Low).

After selecting and reviewing digital medical records, the information was completed in a data collection form consisting of clinical components, the alteration of parameters, and interventions performed during hospitalization. Information was collected from August 2018 to December 2018. The cleansing and verification of the database was carried out by external research staff; the statistical analysis considered qualitative variables expressed by means of frequency and/or percentage tables with a 95% CI 95%, quantitative variables are expressed with averages, standard deviation and CI

95%. The database used was Microsoft Excel 2013 software and was analyzed with Epiinfo 7.1.1.1 and SPSS 21, statistical programs. Test X2 is used when comparing the variables of interest with significance levels  $p < 0.05$ .

### Ethical considerations

Approval was requested from the Santiago de Cali University's Ethics Committee to perform the study according to Act 2 of February 17, 2017. It was accepted by the Helsinki Declaration of the American Medical Association and Resolution 8430 of the Colombian Ministry of Health 1993, which was endorsed by the institution where the study was conducted.

## RESULTS

### General aspects

We verified 308 pregnant women who were admitted to the hospital and SOCU according to the sample, which met the following inclusion criteria: Ages from 14 to 45 with an average age of 28 years and a standard deviation (SD) of 6394, hospitalization time between 2 and 29 days, with an average of 6 days stay and a SD of 3190. At the time of the study, 72.1% with a CI of 95% (66.65–76.94) were in the third trimester of pregnancy (see Table 1).

**Table 1. General characteristics of pregnant women:**

<b>VARIABLE</b> <i>n=308</i>		<b>Fr(%)</b>	<b>CI (95%)</b>
<i>Age group</i>	< 18 years	13(4.2)	2.36–7.29
	18–24 years	93(30.1)	25.18–35.71
	25–31 years	119(38.6)	33.21–44.35
	32–38 years	68(22.1)	17.66–27.21
	>39 years	15(4.8)	2.85–8.08
<i>Inpatient stay</i>	<3 days	218(70.8)	65.30–75.73
	4–6 Days	68(22.1)	17.66–27.21
	7–9 Days	14(4.5)	2.60–7.68
	>10 Days	8(2.6)	1.21–5.25
<i>Trimester of pregnancy</i>	I trimester	26(8.4)	5.69–12.27
	II trimester	60(19.5)	15.30–24.44
	III trimester	222(72.1)	66.65–76.94

### Clinical features

The pregnant women in the study had between 1 and 7 pregnancies with an average of 2 pregnancies and a SD of 1,085; 47.1% of them were primiparous CI 95% (41.41–52.82). Only 36.4% had no pathological history CI 95% (31.03–42.04). Women with

comorbidities were those who were had diagnosed with chronic blood pressure 9.1% CI 95% (6.23–13.01); renal lithiasis 8.4% CI 95% (5.69–12.27); asthma 19% CI 95% (3.86–9.63); cholelithiasis, hypothyroidism, and urinary tract infection in 3.6% IC 95% (1.89–6.48). Among those with an obstetric medical history 18.5% CI 95% (14.42–23.40) were related to abortion (See Table 2).

**Table 2. Clinical conditions of pregnant women**

<b>VARIABLE</b>		<b>Fr/% CI (95%)</b>	
<i>n = 308</i>			
<i>Frequency of pregnancies</i>	1 pregnancy	145(47.1)	41.41–52.82
	2 pregnancies	83(26.9)	22.15–32.33
	3 pregnancies	57(18.5)	14.42–23.40
	4 pregnancies	15(4.9)	2.85–8.08
	5 pregnancies	5(1.6)	0.60–3.97
	6 pregnancies	2(0.7)	0.11–2.58
	7 pregnancies	1(0.3)	0.02–2.08
<i>Medical History</i>	Yes	196(63.6)	57.96–68.97
<i>Pathological: Medical History</i>	No	112(36.4)	31.03–42.04
	Abortion	57(18.5)	14.42–23.40
<i>Obstetric:</i>	Cesarean	21(6.8)	4.37–10.39
	Ectopic	2(0.7)	0.11–2.58
	Fetal death	7(2.2)	1.00–4.83
	Oligohydramnios	1(0.3)	0.02–2.08
	Preterm birth	1(0.3)	0.02–2.08
	Does not have any	219(71.1)	65.64–76.03
<i>Alteration parameters</i>	Yes	277(89.9)	85.88–92.96
	No	31(10.1)	7.04–14.12

The mode of delivery for those who have had children was 55.5% vaginally CI 95% (47.31–63.5) and those who had them by C-section corresponded to 44.4% CI 95% (36.4–52.6). The frequency of pregnancies was between 1 and 4 children, corresponding to 67.3% CI 95% (59.28–74.68) to a single child and 24.8% CI 95% (18.21–32.46) to two children.

Altered parameters of the Early Warning Scale in study participants were between 0 and 44, displaying between 0 and 44 with an average of 4 and one of 4898. Those who did have children corresponded to 10.1%, IC 95% (7.04–14.12) (see Table 2).

Pregnancy-related morbidity was 80.2% CI 95% (72.21–84.41) of hospitalized women. The most common diagnoses according to the International Classification of Diseases (ICD 10) were preeclampsia in pregnancy at 38.2% CI 95% (32.62–43.98) with a higher proportion in nulliparous women (53.1%); urinary tract infection 12.8% CI 95% (9.25–17.19); gestational diabetes mellitus with 3.4% CI 95% (1.63–6.13); pelvic-perineal pain corresponded to 3% CI 95% (1.40–5.69); premature rupture of membranes 2.4% CI 95% (0.96–4.81); placenta previa 2% CI 95% (0.75–4.36).

No significant differences occurred when verifying the gestational trimester with obstetric medical history  $p < 0.17$ . When parity was related to pathological history, a significance of  $p < 0.002$  was obtained, and while reviewing parity with morbidity in pregnancy there were no significant differences  $p < 0.21$ .

### Parameter alteration

**Table 3. Individual alterations in Early Warning Scale parameters**

<i>Individual Alteration</i> <i>N = 308</i>	<i>Total</i>			
	<i>Yes</i>		<i>No</i>	
	<i>Fr (%)</i>	<i>IC95%</i>	<i>Fr (%)</i>	<i>IC 95%</i>
<i>Temperature</i>	10(3.2)	1.66–6.08	29(96.8)	93.92–98.34
<i>Systolic Pressure</i>	<i>Blood</i> 216(70.1)	64.63–75.12	92(29.9)	24.88–35.37
<i>Diastolic pressure</i>	<i>blood</i> 174(56.5)	50.75–62.07	134(43.5)	37.93–49.25
<i>Heart rate</i>	63(20.4)	16.18–25.48	245(79.6)	74.52–83.82
<i>Respiratory rate</i>	89(28.9)	23.97–34.36	219(71.1)	65.64–76.03
<i>Blood Saturation</i>	<i>Oxygen</i> 4(1.3)	0.42–3.52	304(98.7)	96.48–99.58
<i>Pain</i>	77(25.0)	20.34–30.29	231(75.0)	69.71–79.66

During hospitalization, individual parameters according to the Early Warning Scale showed that the alteration of systolic blood pressure was higher at 70.1% CI 95% (50.75–62.07) and with lower proportion oxygen saturation with 98.7% CI 95% 96.48–99.58 (See Table 3). There were no findings of pregnant women having their parameters altered with regards to their neurological state.

**Table 4. Clinical History, Age, and Hospital stay relationship with altered parameters.**

<i>Variables</i>	<i>With alteration</i> <i>Fr (%)</i>	<i>Without alteration</i> <i>Fr (%)</i>	<i>P-value</i>
<i>Age group</i>			
< 29 years	154 (57.2)	18 (46.1)	<0,19
>30 years	115 (42.8)	21(53.9)	
<i>Inpatient Stay</i>			
<5 days	184(68.4)	33(84.6)	<0.03
>5 days	85(31.6)	6(15.4)	
<i>Parity</i>			
Yes	72(26.8)	10(25.6)	<0.88
No	197(87.2)	29(12.8)	

<i>Medical History</i>			
<i>Pathological:</i>			
Yes	177(65.8))	19(48.7)	<0.03
No	92(34.2)	20(51.3)	
<i>Medical History</i>			
<i>Obstetric:</i>			
Yes	77(28.6)	12(30.8)	<0.78
No	192(71.4)	27(69.2)	

No significant statistical differences were found with regards to age and obstetric medical history when altered parameters of pregnant women were evaluated  $p < 0.19$ ; however, statistical differences were observed when reviewing hospital stay of less and more than 5 days hospitalization  $p < 0.03$  and pathological medical history with a  $p < 0.03$ . (See Table 4).

**Table 5. Presence of individual alteration according to morning, afternoon, and night sessions**

<i>Individual alteration</i> n=308	<b>Yes</b>		<b>No</b>	
	<i>Fr (%) CI 95%</i>		<i>Fr (%) CI 95%</i>	
<i>RED MORNING</i>	36(11.7)	4.42–15.94	272(88.3)	84.06–91.58
<i>RED AFTERNOON</i>	18(5.8)	3.60–9.24	290(94.2)	90.76–96.40
<i>RED NIGHT</i>	18(5.8)	3.60–9.24	290(94.2)	90.76–96.40
<i>YELLOW MORNING</i>	235(76.3)	71.07–80.86	73(23.7)	19.14–28.93
<i>YELLOW AFTERNOON</i>	118(38.3)	32.90–44.02	190(61.7)	55.98–67.10
<i>YELLOW NIGHT</i>	87(28.3)	23.36–33.69	221(71.7)	66.31–76.64

It was observed that when a vital parameter is altered, nursing staff perform specific care interventions and report to the physician in order to help pharmacological and nonpharmacological therapeutic measures to be adopted. With reference to the shifts of the day where alterations were present, it was evident that the altered parameter with the highest detection in red happened in the morning hours 11.7% CI 95% 4.42–15.94 and yellow with 71.7% without detection during night hours (see Table 5).

## DISCUSSION

Maternal morbidity and mortality involve factors related to age, pathological history, and the method of delivery. In this study, pregnant women admitted for hospitalization and SOCU services were aged between 14 years and 45 years with an average age of 28 years; in a study conducted on a third-level hospital in Brazil <sup>(9)</sup> the average age of the women in the study was 28.8 years, with a SD of 7.81, a minimum of 15 years and

a maximum of 43 years, 4.8% were above 39 years of age. A study carried out in Beijing demonstrated that the prevalence of diabetes and hypertension increases with age <sup>(10)</sup>. Creanga et al <sup>(11)</sup> found that 19.4% of pregnancy-related mortality occur among women aged 35 and older.

It is very important to promote counseling in sexual and reproductive health which would help to minimize the related risks and maintain a safe pregnancy. With regards to pathological history, only 36.4% had no pathological history CI 95% (31.03–42.04) and those who had, were diagnosed with chronic high blood pressure 9.1% CI 95% (6.23–13.01), diabetes 2.27% CI 95% (1.00–4.83). In the United States <sup>(12,13)</sup>, it was found that pregnant women had conceived despite their chronic health conditions, such as diabetes, hypertension, and heart disease, which increase the risk of adverse obstetric outcomes. A history of preeclampsia has been shown to increase the risk of heart events and myocardial infarction <sup>(14)</sup>.

In this study 83.3% of the causes of hospitalization were direct and 16.3% indirect (CIOS). Preeclampsia was the most direct cause with 38.2% CI 95% (32.62–43.98). In developing and developed countries, ICU admission due to hypertension is between (39.8%–32.5%) <sup>(15)</sup>. According to analysis by the World Survey of Maternal and Neonatal Health made by the WHO, CIOS were responsible for 20.9% of cases with severe morbidity <sup>(16)</sup>. In the ICU services in Australia, cardiothoracic and vascular ICU, and the high dependency unit it was seen that 25% of admissions were because of hypertension. In a study conducted in Brazil in an ICU, the direct cause represented 61% and preeclampsia occupied 11% of causes of hospital admission <sup>(17)</sup>.

In relation to the delivery method, 55.5% corresponded to vaginal delivery CI 95% (47.31–63.5) and C-section delivery corresponded to 44.4% CI 95% (36.4–52.6) higher than the incidence observed by Spong et al <sup>(18)</sup>, the rate of cesarean births in the United States has increased to more than 30%. According to Clark et al., the maternal mortality rate corresponded with the method of delivery to 0.2 per 100,000 for vaginal and 2.2 per 100,000 for cesarean methods of delivery <sup>(18)</sup>.

During hospitalization, individual parameters according to the Early Warning Scale demonstrated that alteration of systolic blood pressure was higher by 70.1% CI 95% (50.75–62.07), followed by diastolic blood pressure 56.5% CI 95% (50.75–62.07) in the second place, and respiratory distress with 28.9% CI 95% (23.97–34.36) in the third place. Some studies have described the respiratory rate as one of the most accurate pathological parameters for predicting a clinical outcome <sup>(19-21)</sup> and is a more sensitive indicator of severe morbidity <sup>(22-24)</sup>.

Data on the vigilance of maternal mortality in the United States, France, and United Kingdom report that between 40%–50% of maternal deaths are potentially preventable. In addition, it is observed that delays in the detection, diagnosis, and treatment precede most deaths from causes such as bleeding, hypertension, infection, and venous thrombosis. It has been shown that up to 80% of patients can present with abnormalities in their vital signs 24 hours prior to showing effects <sup>(25,26)</sup>. Therefore, optimal care and early detection of deterioration are important factors to prevent complications <sup>(27,28)</sup>.

The limitations of the study prevent delving further into nursing intervention actions and their effectiveness in the evolution of maternal morbidity. However, the nursing



staff performs continuous evaluations of vital signs, it is their responsibility to communicate and alert the responsible health care team, so that appropriate care can be planned and managed, in order to make the necessary corrections when any alterations are observed. Prior training of medical and nursing staff on applying the Early Warning Scale is necessary to activate the alert and inform on the critical processes within the alert system and the role that each member of the health team plays. The implementation of the system warrants that it be adapted to the processes and institutional culture, in addition to timely audit processes being performed in order to evaluate the result of its application with clinical cases where the members of the health team's response to the alterations is analyzed.

When an appropriate treatment is provided to the alterations in health status of pregnant women in a timely manner, it improves early diagnosis and interventions that can control the morbidity and decrease the complications that can lead to maternal death.

## CONCLUSION

Systolic blood pressure by 70.1%, diastolic blood pressure by 56.5%, and respiratory distress by 28.9% were the vital parameters with the greatest alteration in pregnant women in hospitals and SOCU service.

The Early Warning Scale is an important tool in maternal assessment. Nursing and medical staff should incorporate timely and relevant records into their daily work to monitor and diagnose extreme maternal morbidity.

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