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Association between preoperative physical status classification and intraoperative bleeding in emergency cesarean sections

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Abstract
Background: The preoperative physical status, assessed using the ASA scale, is an essential clinical parameter for estimating anesthetic-surgical risk and predicting perioperative mortality. In the obstetric context, intraoperative bleeding during emergency cesarean sections is a frequent and significant complication. However, there is little evidence directly linking the ASA classification to this specific outcome.
Objective: To determine the association between the preoperative physical status classification (ASA) and intraoperative blood loss in emergency cesarean sections.
Materials and Methods: A descriptive, observational, cross-sectional, single-center, prospective study was conducted. The sample consisted of 209 patients who met the criteria from January to December 2024, using non-probabilistic consecutive sampling. Each patient was assigned an ASA classification. Bleeding was quantified by visual estimation using gauze colorimetry. Descriptive statistics were used initially, followed by inferential analysis using Pearson's chi-square (χ^2) test to determine the association, with a significance level of $p < 0.05$. Data were processed using IBM SPSS Statistics 25.
Results: A total of 209 patients undergoing emergency cesarean sections were studied. Regarding the ASA classification, the majority were ASA II (85.6%, N=179), followed by ASA III (12.4%, N=26), and ASA IV (1.9%, N=4). Regarding intraoperative bleeding, 98.56% (N=206) experienced mild blood loss (500-1000 mL), while 1.44% (N=3) exhibited moderate bleeding (1000-2000 mL). No patient experienced bleeding greater than 2000 mL. The inferential analysis found no statistically significant association between the ASA classification and the degree of intraoperative bleeding (p-value = 0.534, $p > 0.05$).
Conclusions: No statistically significant association was found between the ASA classification and intraoperative bleeding in patients undergoing emergency cesarean section.

Keywords: ASA, intraoperative bleeding, emergency cesarean section

Introduction

The preoperative physical status determined by the American Society of Anesthesiology (ASA) is a stratification system adopted by anesthesiologists to classify the health status of patients prior to a surgical procedure [1, 2]. Described in 1963, its purpose is to stratify health status and assign anesthetic/surgical risk [1, 2]. The classification has a subjective character, dependent on each anesthesiologist [3]. Unlike multifactorial indices, the ASA scale is used routinely, although it does not determine a specific predictive outcome after surgery [4], which limits its value as an intraoperative predictor [5].
Its main benefit is simplicity, being based exclusively on clinical evaluation without the need for additional tests that delay the assessment [6]. Numerous studies have shown that the ASA classification correlates well with perioperative, intraoperative, functional risk, and mortality [7]. The scale is constantly updated, with the latest modification on December 13, 2023 [8], where clinical examples were added to reduce operator-dependent variability [9]. The ASA also recommends creating examples of local classifications [10].

The scale is divided into 6 statuses:

- **ASA I:** A normal healthy patient (mortality 0.3%)

- **ASA II:** A patient with mild-moderate systemic disease without substantial functional limitations (e.g., controlled HTN/DM, pregnancy, obesity BMI 30-40).
- **ASA III:** A patient with moderate-severe systemic disease [e.g., uncontrolled HTN/DM, BMI > 40, active hepatitis, controlled COPD, moderate reduction in LVEF), (Mortality 1.8-5.4%].
- **ASA IV:** A patient with severe systemic disease that is a constant threat to life (e.g., unstable angina, poorly controlled COPD, severe valvular dysfunction) (Mortality 0.3-1.4%). *Note: The original text presents a conflicting mortality range for ASA IV, lower than ASA III.*
- **ASA V:** A moribund patient who is not expected to survive without the operation (e.g., ruptured aneurysm, massive trauma), (Mortality 9.4-57.8%).
- **ASA VI:** A declared brain-dead patient whose organs are being removed for donor purposes [11, 12].

It has been determined that the ASA classification has a sensitivity of 68% and a specificity of 79% [13]. It is advised to perform the ASA assignment prior to the day of surgery, except in urgent procedures [14]. Its greatest significance is as a "ceremonial" tribute to the physicians who attempted to define anesthetic risk in the past [15]. A correct classification allows for communicating risks, guiding the health team, reducing anxiety, and improving satisfaction [16]. Despite its international use, the scale is subjective due to the dynamic state of the patient and the modifications to the classification over the years [17]. The use of examples and clinical simulations is necessary to standardize its application [18]. Currently, only patients classified as ASA III or higher are referred to anesthesiologists, so its proper use improves resource allocation [19].

The pregnant patient is classified as ASA II due to the physiological changes of gestation. There are hematological and coagulation alterations, such as an increase in red blood cells (30%) and a greater increase in plasma volume (45%), leading to physiological anemia. Pregnancy is a hypercoagulable state due to blood stasis and an increase in coagulation factors (VII, VIII, IX, X, XII), fibrinogen, and von Willebrand factor [20]. This decreases postoperative bleeding but increases the risk of thromboembolism [20].

Obstetric hemorrhage is currently defined as bleeding > 1000 ml regardless of the delivery route, associated with signs of hypovolemia. The main causes are uterine atony (60-70%), placental remnants (20%), trauma (5-10%), and coagulation disorders (5-10%). Medications such as SSRIs and aspirin can also increase the risk [21]. Quantitative assessment of blood loss and evaluation of complete blood count and coagulation studies are important [22].

There are limited publications on the association between ASA and intraoperative bleeding in cesarean sections. Dripps and Lamont assigned ASA classifications; for example, pregnancy without related complications is determined as ASA I, while gestational hypertension or gestational diabetes is ASA II, and moderate preeclampsia or gestational diabetes requiring insulin is ASA III [23]. A Swedish study (Norlin H. and Albert J.) of emergency cesarean sections (2016-2022) looked for a relationship between ASA and 30-day mortality, finding an increase in the mean age and in the proportion of ASA III/IV, but a decrease in mortality [24]. Owens WD et al. demonstrated inconsistency in the assignment of ASA in pregnant patients [25]. Hopkins (2016) found that a higher ASA score is associated with a higher risk of mortality at 48 hours [26]. Butwick et al. (2014) identified ASA III or IV classification as a risk factor for hemorrhagic morbidity in patients with uterine atony [27].

Materials and Methods

A descriptive, observational, cross-sectional, single-center, and prospective study was conducted at the General Zone Hospital Number 20 "La Margarita" of the IMSS in Puebla, Puebla. The study adhered to the principles of the Declaration of Helsinki, the regulations of the General Health Law on Health Research, and the Belmont Report. Data confidentiality was guaranteed. The investigation was considered minimal risk. Authorization to participate was obtained from the patients.

The study population consisted of pregnant women aged 18 to 35, IMSS beneficiaries, hospitalized in the obstetrics service of HGZ No. 20 during the study period. The collection period was from January to December 2024.

The inclusion criteria were beneficiaries aged 18 to 35 assigned to HGZ No. 20, from both shifts, who were admitted for emergency cesarean section, with a BMI less than 35.

The exclusion criteria included: patients with coagulation disorders (prolonged times, thrombocytopenia < 100,000/mcl or Fibrinogen < 200 mg/dl), patients without an assigned ASA status, and a diagnosis of placenta accreta.

The elimination criteria were patients whose procedure ended in vaginal delivery or death before or during surgery.

A sample size of 209 pregnant patients was calculated, based on a population of 461 patients registered for emergency cesarean section over 6 months, with a 95% confidence level ($Z\alpha$ = 1.96), an expected proportion of 50% (P=0.50, q=0.50), and 5% precision. The sampling method was non-probabilistic consecutive sampling.

The variables studied included: Age (discrete quantitative), ASA (ordinal qualitative: II, III, IV), Comorbidities (nominal qualitative), Weight (continuous quantitative), BMI (ordinal qualitative), and Intraoperative bleeding (ordinal qualitative: Mild 500-1000 mL, Moderate 1000-2000 mL, Severe > 2000 mL).

Data was collected from the anesthetic record sheet at the end of the surgical event. Intraoperative bleeding was quantified by means of gauze and compress colorimetry.

Results

The study was conducted at HGZ 20, drawing a final sample of 209 patients who underwent emergency Cesarean sections. Among the quantitative variables analyzed were age and weight. The Kolmogorov-Smirnov normality test was applied to these variables, resulting in a p-value of < 0.05, which indicates a non-normal [free] distribution.

As shown in Table 1, the median age of our population was 29 years, with an interquartile range [IQR] of 6. The participants' ages ranged from a minimum of 18 to a maximum of 42 years. Regarding weight, the median obtained was 75 kg with an IQR of 12. The observed weights ranged from a minimum of 55 kg to a maximum of 99 kg.

Table 1: Age and weight

Variable	Median	Interquartile Range (IQR)	Range (Max-Min)
Age [years]	29	6	18-42
Weight [Kg]	75	12	55-99

Table 2 illustrates the findings for Body Mass Index (BMI). The results show that 4.8% (N=10) of the subjects had a normal weight, 27.8% (N=58) were categorized as overweight, and 67.5% (N=141) were categorized as obese. It is clear from this data that the majority of the study population falls into the obesity group.

Table 2: Body mass index category

BMI Category	Frequency (n)	Percentage (%)
Normal	10	4.7
Overweight	58	27.8
Obesity	141	67.5
Total	209	100

Regarding comorbidities, the data shows that the vast majority of the population (87.1%, N=182) had no concurrent health conditions. Among those with pre-existing diagnoses, 9.1% (N=19) had gestational diabetes, 2.4% (N=5) had hypothyroidism, and 3.8% (N=8) presented with other comorbidities. We can therefore determine that the majority of our population falls into the group with no comorbidities. (See Table 3).

Table 3: Comorbidities

	Hypothyroidism	Gestational diabetes	Other comorbidities	No comorbidities
Frequency	5	19	8	182
Percentage	2.40%	9.10%	3.80%	87.10%

Upon examining the American Society of Anesthesiologists [ASA] physical status classification, most participants in our cohort were designated as ASA class II, representing 85.6% (N=176). A smaller proportion, 12.4% (N=26), fell under ASA class III, whereas merely 1.9% (N=4) were classified as ASA class IV. Refer to Table.

Table 4: (ASA) physical status classification

Classification ASA		
	Frequency [N]	Percentage [%]
II	179	85.6
III	26	12.4
IV	4	1.9
Total	209	100.0

Concerning intraoperative blood loss, the vast majority of our study population, 98.56% (N=206), experienced bleeding ranging from 500 to 1000 mL, which was classified as mild. Only 1.44% (N=3) presented moderate bleeding between 1000 and 2000 mL. None of the patients exhibited blood loss exceeding 2000 mL (see Table 5).

Table 5: Distribution of intraoperative blood loss

Classification	Volume (mL)	Frequency (n)	Percentage (%)
Mild	500-1000	206	98.56
Moderate	1000-2000	3	1.44
Severe	> 2000	0	0
Total		209	100

To assess the relationship between ASA physical status classification and perioperative hemorrhage in urgent cesarean sections, Pearson's Chi-square test was performed. The statistical analysis revealed $\chi^2 = 1.254$, P=0.534 ($p>0.05$), demonstrating the absence of a statistically significant correlation between preoperative ASA classification and intraoperative bleeding volume. Consequently, we failed to reject the null hypothesis (refer to Table 6).

Table 6: Chi-Square Test for Association between ASA Classification and Intraoperative Bleeding

Variables Tested	Statistical Test	$\chi 2$ Value	P-Value	Significance	Conclusion
ASA Physical Status vs. Intraoperative Bleeding Volume	Pearson's Chi-square	1.254	0.534	$p>0.05$ [Not Significant]	Fail to reject null hypothesis

Discussion

The classic study by Dripps, Lamont, and Echenhoff (1961) demonstrated that the ASA classification has a direct relationship with surgical morbidity and mortality [23]. In contrast, the present study found no statistically significant relationship (P=0.534) between the ASA classification and

intraoperative bleeding in emergency cesarean sections. The majority of the patients were ASA II (85.6%) and presented mild bleeding (98.56%). These results suggest that, while the ASA is a reliable indicator of overall anesthetic risk, it does not necessarily predict the magnitude of bleeding in the obstetric context [23].

The study by Norlin H et al. (2023) in Sweden evaluated the relationship between age, ASA, and 30-day mortality, finding that although age and ASA increased, mortality remained low [24]. In our study, with a median age of 29 years and obesity in 67.5%, no significant association between ASA and bleeding was found either (P=0.534). Both studies agree that the ASA reflects general physical status but is not directly related to immediate complications such as bleeding or mortality in cesarean sections [24].

Owens, Felts, and Spitznagel (1978) evaluated the consistency in the application of the ASA, showing significant variability and subjectivity [25]. Our study, where the majority were ASA II (85.6%) with no association with bleeding (P=0.534), reinforces that the ASA scale may have limitations in predicting specific outcomes like intraoperative bleeding [25].

Hopkins et al. (2016) demonstrated that the higher the ASA category, the greater the risk of early postoperative mortality at 48 hours [26]. In contrast, our study found no association between ASA and intraoperative bleeding (P=0.534). This suggests that, although the ASA is useful for predicting mortality, its relationship with events like bleeding in emergency cesarean sections might be limited in young and predominantly healthy obstetric populations [26].

Finally, Butwick et al. (2014) identified the ASA III or IV classification as a risk factor for hemorrhagic morbidity in patients with uterine atony [27]. In our study, with 209 emergency cesarean sections, no significant association was found (P=0.534). The majority of our patients were ASA II (85.6%) with mild bleeding (98.56%) and no comorbidities (87.1%). These differences may be due to the type of population and timely surgical management, explaining the lower incidence of bleeding [27].

Conclusion

The results obtained in this study show that there is no statistically significant association between preoperative physical status (ASA classification) and intraoperative bleeding in emergency cesarean sections. This indicates that the ASA could not be considered a predictive risk factor for obstetric hemorrhage in this context.

The median age of 29 years, the predominance of ASA II, and the high prevalence of obesity reflect a stable clinical profile. Although the literature suggests that a higher ASA may be associated with a higher risk of hemorrhagic events, there are very few studies that directly quantify the volume of bleeding in emergency cesarean sections according to ASA. Therefore, the confirmation of the absence of a significant association represents an original contribution, filling a gap in the literature and providing specific information about the population at HGZ 20.

This study confirms that, in the clinical practice at HGZ20, the preoperative physical status [ASA] is not significantly associated with the volume of intraoperative bleeding in emergency cesarean sections. Despite the limitation of specific antecedents, the results are clinically relevant and demonstrate the importance of preoperative assessment.

Conflict of Interest
Not available

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Not available

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