

Research Article

Assosiation between Serum Cortisol Levels and Anxiety levels In Elective and Emergency Cesarean Section

Hubungan antara Kortisol Serum dan Tingkat Kecemasan pada Operasi Seksio Sesarea Elektif dan Darurat

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Abstract

Objective: To detect anxiety before elective and emergency cesarean section.

Methods: This study was a cross-sectional study. The number of research samples was 42 samples consisting of 21 pregnant patients with an elective cesarean section plan and 21 pregnant patients with an emergency cesarean section at Prof. RSUP. Dr. R. D. Kandou Hospital Manado and Network Hospital in Manado from March 2021 to June 2021. Anxiety was assessed by examining serum cortisol and anxiety levels according to the Hamilton questionnaire (HAM-A). The data were then analyzed using SPSS version 23.0 software.

Results: Cortisol levels were higher in emergency cesarean section (mean 21.590 ± 11.6392) compared to elective cesarean section (mean 10.586 ± 4.9501). Anxiety levels according to HAM-A scores were higher in emergency cesarean section (mean 15.33 ± 7.722) compared to elective cesarean section (mean 7.19 ± 3.614).

Conclusion: There was a significant positive correlation between cortisol levels and anxiety levels based on HAM-A scores.

Keywords: cesarean section, cortisol, HAM-A score anxiety.

Abstrak

Tujuan: Untuk mendeteksi kecemasan sebelum tindakan seksio sesarea elektif dan emergensi.

Metode: Penelitian ini merupakan suatu penelitian cross-sectional. Jumlah sampel penelitian 42 sampel terdiri dari 21 pasien hamil dengan rencana seksio sesarea elektif dan 21 pasien hamil dengan rencana seksio sesarea emergensi di RSUP Prof. Dr. R. D. Kandou Manado dan RS Jejaring di Kota Manado dari bulan Maret 2021 sampai bulan Juni 2021. Kecemasan dinilai melalui pemeriksaan kortisol serum dan tingkat kecemasan menurut kusioner Hamilton (HAM-A). Data kemudian dianalisis dengan menggunakan software SPSS versi 23.0.

Hasil: Kadar kortisol secara rata-rata lebih tinggi pada seksio sesarea emergensi (mean 21.590 ± 11.6392) dibandingkan dengan seksio sesarea elektif (mean 10.586 ± 4.9501). Tingkat kecemasan menurut skor HAM-A secara rata-rata lebih tinggi pada seksio sesarea emergensi (mean 15.33 ± 7.722) dibandingkan dengan seksio sesarea elektif (mean 7.19 ± 3.614).

Kesimpulan: Terdapat korelasi positif bermakna antara kadar kortisol dan tingkat kecemasan berdasarkan skor HAM-A pada semua subjek penelitian.

Kata kunci: kortisol, seksio sesarea, skor HAM-A. kecemasan.

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INTRODUCTION

Pregnancy and childbirth, both vaginally and cesarean section are considered physiological situations that cause anxiety and stress. The prevalence risk of depression or anxiety in dealing with vaginal delivery in Indonesia in 2015 was 10-25%. The incidence of depression or anxiety complicates the delivery process around 10-15%, but until now there is still little attention paid to anxiety disorders in pregnancy. ACOG recommends that obstetric care providers screen patients at least once during the perinatal period for the evaluation of anxiety and depression symptoms.^{1,2}

Cesarean section can be performed as an elective or emergency procedure. Emergency cesarean section is performed in an emergency, with indications including fetal distress, cephalopelvic disproportion, failed induction, uterine inertia, and history of cesarean section. Elective cesarean section is a planned procedure usually performed at term pregnancy, where the incidence of neonatal tachypnea is less.³

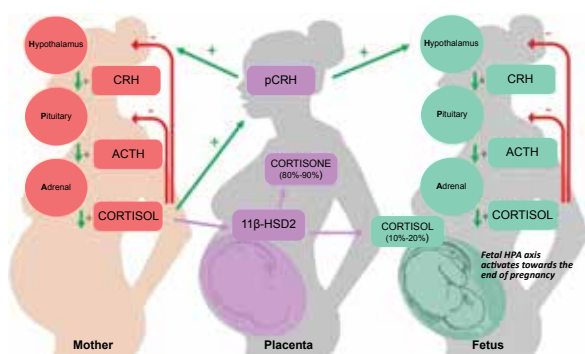


Figure 1. HPA axis dan cortisol level during pregnancy.⁴

Stress plays an important role in the onset and persistence of anxiety. Cortisol is released in response to stress and is a key physiological marker of the stress response. Increased cortisol during pregnancy is associated with worsening labor outcomes and affects fetal development and even lasts to adulthood. Cesarean section has various risks but is often considered a routine procedure, so the potential for side effects, especially psychological, are often overlooked. Cortisol in emergency and elective surgery increased, but in emergency surgery, there was a more significant increment. Another study using a questionnaire for the assessment of anxiety, also found that mothers who underwent emergency cesarean section experienced higher anxiety than electives. However, there has not been much

research on anxiety before caesarean section by combining subjective (eg questionnaires) and objective (eg anxiety-related hormones) parameters.⁴⁻⁶

Based on the reasons above, to anticipate the occurrence of anxiety and its adverse effects on the mother and fetus, this study was conducted to examine the relationship between serum cortisol levels in pregnant women and anxiety during elective cesarean sections and emergency cesarean sections. We hoped that the results of this study can be applied to detect anxiety earlier so we can prevent adverse effects on mothers and babies undergoing cesarean section.

METHODS

This study was a cross-sectional study conducted at the Department of Obstetrics and Gynecology Prof. DR. R. D. Kandou Central General Hospital, Pancaran Kasih Hospital, Bhayangkara Hospital and Pramita Clinical Laboratory in Manado. This research was started from March to June 2021, sampling was carried out using a consecutive sampling technique, which included all respondents who met the inclusion criteria until the number of samples was met. The population in this study were pregnant women who came to RSUP Prof. Dr. R. D. Kandou Manado, network hospital (Pancaran Kasih Hospital, Bhayangkara Hospital) in Manado and who were planned for cesarean section during the period March to June 2021.

The inclusion criteria of this study were all pregnant women with gestational age more than 28 weeks who came to the ER or Polyclinic at the Obstetrics and Gynecology Section of Prof. Dr. R.D. Kandou Manado and network hospitals in Manado, that were decided for an emergency cesarean section, or those who came without signs of labor and were planned for an elective cesarean section. Patients willing to participate in this study were asked to sign an informed consent. The exclusion criteria in this study were patients who had a pregnancy with suspected/probable/confirmed COVID-19, pregnancy with chronic disease, such as chronic hypertension, diabetes mellitus, kidney disease, heart disease, obesity, received steroid therapy in the last 72 hours, twin pregnancy, fetal death, congenital abnormalities of the fetus, non-obstetric problems such as family problems, domestic violence, financial problems or mothers who are not willing to participate in the study. The

number of subjects was 42 patients consisting of 21 pregnant patients with an elective cesarean section plan and 21 pregnant patients with an emergency cesarean section at Prof. RSUP. Dr. R. D. Kandou Manado and Network Hospital in Manado City.

The dependent variable in this study was the category of cesarean section which was carried out as an elective or emergency. While the independent variables in this study were serum cortisol levels and anxiety levels. The independent variable was assessed by examining serum cortisol which was carried out 2 days before an elective cesarean section or 2 hours after the decision for an emergency cesarean section. The collected serum was then determined for cortisol levels using the immulite cortisol method. Anxiety level was measured by the Hamilton questionnaire (HAM-A) consisting of 14 assessments. Interviews for filling out the questionnaires were conducted immediately after the blood sampling.

Data obtained from serum cortisol levels and anxiety levels through questionnaires were collected, processed and then analyzed using SPSS software 23rd version. To assess the relationship between cortisol levels during elective and emergency cesarean sections, a chi-square and t independent test was performed if the data were normally distributed, or alternatively, Fischer exact or Mann-Whitney test if they were not. Meanwhile, to assess the correlation of anxiety to elective and emergency cesarean sections, logistic regression statistical tests were carried out.

RESULTS

This study was conducted on a population of pregnant women with a total of 42 subjects. The research subjects consisted of 21 pregnant women with an emergency cesarean section and 21 pregnant women with an elective cesarean section who all met the inclusion and exclusion criteria and signed informed consent to participate in this study. The characteristics of the complete research subjects are shown in Table 1.

Table 1. Characteristics of Respondents

Characteristic	Elective Cesarean Section		Emergency Caesarean Section	
	N	%	N	%
Age (y o)				
20-34	14	67	12	57
≥ 35	7	33	9	43
Education				
Junior HS	1	5	2	10
Senior HS	15	71	12	57
University	5	24	7	33
Occupation				
Unemployed	18	86	10	48
Working	3	14	11	52
Gravid				
Primigravid	5	24	4	19
Multigravid	15	71	15	71
Grandmulti	1	5	2	10

The data above showed that in the elective and emergency cesarean section, the highest percentage was the age group of 20-34 years old. Based on education level, in the elective and emergency cesarean section, the highest percentage was Senior High School. Based on occupation, in the elective cesarean section group, the highest percentage was in the unemployed group, while in the emergency cesarean section group, the highest percentage was in the working group. Based on gravid status, in the elective and emergency cesarean section group, most groups were multigravid.

Table 2. Cortisol serum level in Elective and Emergency Cesarean Section

Cortisol Serum Level ≥ 19.4 µg	Elective Cesarean Section		Emergency Caesarean Section		P-value
	N	%	N	%	
Normal	21	100	15	71.43	0.021
Increase	0	0	6	28.57	
Total	21	100	21	100	

The results of Fischer's exact test, p value = 0.021 ($p < 0.05$), indicated a significant relationship between cortisol levels and the incidence of emergency cesarean section. In table 2, it can be seen that cortisol levels in the elective cesarean section group, all samples had normal cortisol levels, namely 21 people (100%). In the emergency cesarean section group, there were 6 respondents (28.57%) who experienced an increment in cortisol levels.

Table 3 showed the distribution of serum cortisol levels in elective and emergency cesarean sections. In the elective cesarean section, the mean was 10.586 ± 4.9501 , while in the emergency cesarean section the mean was 21.590 ± 11.6392 . Cortisol levels were higher on average in the emergency cesarean section compared to elective cesarean section.

Table 3. Mean Distribution of Cortisol Serum Level in Elective and Emergency Cesarean Section

Variable	Elective Cesarean Section (n=21)		Emergency Cesarean Section (n=21)	
Cortisol level	Mean	10.586	Mean	21.590
	Median	10.500	Median	18.200
	Std Deviation	4.9501	Std Deviation	11.6392
	Minimum	2.5	Minimum	9.6
	Maximum	17.1	Maximum	49.0

Furthermore, Table 4 showed the level of anxiety according to the Hamilton scale (HAM-A). In the elective cesarean section, none experienced anxiety (0%). In the emergency cesarean section group, 8 people (38%) did not feel anxiety, 8 people (38%) experienced mild anxiety, 3 people (14%) experienced moderate anxiety as much

as 3 people, and 22 people (10%) experienced severe anxiety. The Mann-Whitney statistical test showed that there was a significant difference in HAM-A scores between the elective cesarean section and the emergency cesarean section ($p = 0.001$).

Table 4. Anxiety score (HAM-A) in Elective and Emergency Caesarean Section

Anxiety score	Elective Cesarean Section		Emergency Cesarean Section		P-value
	N	%	N	%	
No anxiety	21	100	8	38	0.001
Mild anxiety	0	0	8	38	
Moderate anxiety	0	0	3	14	
Severe anxiety	0	0	2	10	
Total	21	100	21	100	

In table 5, HAM-A scores were on average higher for emergency cesarean sections than for elective cesarean sections. The Mann-Whitney statistical test showed that there was a significant

difference in HAM-A scores between the elective cesarean section and the emergency cesarean section ($p = 0.001$).

Table 5. Mean Distribution of Anxiety Score (HAM-A) in Elective and Emergency Cesarean Section

Variable	Elective Caesarean Section (n=21)		Emergency Cesarean Section (n=21)	
HAM-A score	Mean	7.19	Mean	15.33
	Median	7.00	Median	17.00
	Std Deviation	3.614	Std Deviation	7.722
	Minimum	0	Minimum	4
	Maximum	13	Maximum	29

The Spearman correlation test showed that there was a significant correlation between cortisol levels and HAM-A in all study subjects ($r = 0.528$ and $p = 0.000$). This can also be seen in the scatter plot image of the correlation between the two.

DISCUSSION

Childbirth is a phase that has a major psychological impact, especially on primiparous mothers. Surgery, especially cesarean section, generally causes anxiety due to fear of the procedure, as well as anesthetic drugs, operating

room, operating equipment, pain, infection, and postoperative inflammatory reactions. This will lead to stimulation of the HPA axis and further increase cortisol secretion. Emergency cesarean section is usually a situation that is more unpredictable, difficult to control, and therefore more prone to causing traumatic stress. Several aspects can affect this, such as age, culture, individual characteristics in dealing with stress, understanding of surgery, surgery history, waiting time for surgery, and anxiety about postoperative problems such as pain, changes in body shape, dependence on others, and possible lifestyle changes after surgery.⁷⁻⁹

The subjective assessment of anxiety was done through a cortisol examination. Cortisol levels were on average higher in emergency cesarean section compared to elective cesarean section. Cortisol in elective and emergency surgery and found that cortisol increased in both types of surgery. However, in emergency surgery, there was a more significant increment. Obtained similar results, where cortisol values were normal in the elective cesarean section on admission, increased significantly immediately before surgery, then decreased to baseline levels at 2 hours after surgery. Cortisol levels vary widely in each individual; therefore, the sampling time was carried out according to the provisions consistently to minimize bias due to diurnal variations in cortisol. If sampling is repeated according to diurnal variations or stress exposure, changes in the diurnal pattern may be more pronounced so that cortisol elevations can be better observed.^{10,11}

In this study, subjective anxiety assessment was carried out with the HAM-A questionnaire, where the level of anxiety according to the HAM-A score was on average higher in emergency cesarean sections compared to elective cesarean sections. In this study, it could be concluded that there is a positive relationship between cortisol levels and anxiety levels according to the HAM-A score with either emergency or elective cesarean section. This is consistent with the research who found that mothers who underwent emergency cesarean section experienced higher anxiety than electives. In this study, there was no anxiety in the elective cesarean section group. There was anxiety in the elective cesarean section before and during hospital admission. Mothers did not experience anxiety when they were admitted to the hospital for elective cesarean section. However, the anxiety increased significantly

during skin suturing and then decreased significantly at 2 hours postoperatively.^{5,6}

Anxiety before surgery can lead to difficult venous access and an increased need for anesthetic drugs. Intraoperatively, anxiety can also cause hypertension, an increased heart rate that can increase the risk of bleeding. During the postoperative period, this anxiety can increase pain, nausea, vomiting, sleep disturbances, fatigue, and fear about postoperative recovery. If it continues, it can interfere with wound healing, increase the risk of infection, change sleep patterns, prolonging the length of treatment and increasing hospital costs.^{8,9,12}

Preoperative education can reduce maternal anxiety. Interventions before and during surgery can calm the mother and even reduce the potential for pain, including music before and during surgery, acupuncture, and hypnosis.^{13,11,14-16}

So far, there have been no studies that evaluate the subjective and objective anxiety simultaneously in mothers who will undergo elective and emergency cesarean sections. This study emphasized that pregnant women awaiting emergency cesarean section experience anxiety before surgery. Therefore, greater attention should be paid especially before emergency cesarean section to identify patients who are at risk of developing anxiety and requiring intervention. In this study, the characteristics of the subjects who vary in age, education level, and gravida can also affect the level of anxiety of each patient. Further research can be conducted to analyze the risk factors for anxiety, to determine the effect of anxiety on the condition of the mother, baby, postoperative care and recovery, and its interventions.

CONCLUSION

Different delivery methods have different stressor effects and neurotransmitter reactions. Surgery, especially cesarean section, generally causes anxiety due to fear of the procedure, as well as anesthetic drugs, operating room, operating equipment, pain, infection, and postoperative inflammatory reactions. Emergency cesarean section is usually a situation that is more unpredictable, difficult to control, and therefore more prone to causing traumatic stress.

Anxiety can be assessed objectively and subjectively. Objectively using cortisol levels and subjectively through a questionnaire. This study shows that there is a relationship between cortisol

levels and HAM-A scores with both emergency and elective cesarean sections. Cortisol levels and subjective anxiety were on average higher in emergency cesarean section compared to elective cesarean section.

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