DOI:10.34084/bshr.1278592 e-ISSN 2587-1641

Journal of Biotechnology and Strategic Health Research

Araştırma Makalesi /Research Article

http://dergipark.org.tr/tr/pub/bshr

Maternal and Fetal Outcomes After Non-Obstetrical Surgery During Pregnancy

Gebelik Sırasında Geçirilen Non-Obstetri Cerrahi Sonrası Maternal ve Fetal Sonuçlar

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Geliş Tarihi / Received : 07-04-2023 **Kabul Tarihi / Accepted:** 12-06-2023 **Yayın Tarihi / Online Published:** 30-08-2023

Özcan A., Yüksel S., Gedik-Özköse Z., Özdemir İ. Maternal and fetal outcomes after non-obstetrical surgery during pregnancy. J Biotechnol and Strategic Health Res. 2023;7(2):97-105

Abstract

Aim In non-obstetric surgeries performed during pregnancy, the continuation of pregnancy and how it will affect the neonatal process are important for both the pregnant women and the surgeon. Studies on non-obstetric surgeries during the pregnancy are limited. The aim of this study is to evaluate maternal and fetal outcomes after non-obstetric surgery.

Material and Method Our study includes the retrospective evaluation of sixty pregnant patients who underwent non-obstetric surgery between January 2015 and August 2020 in our obstetrics clinic, which is a tertiary center. Patient information was obtained from electronic systems and archive files. Demographic characteristics of the patients, the gestational week of the surgery performed, follow-up, pregnancy, and neonatal outcomes were evaluated.

Results The mean age of the patients was 27.9±4.42, and the mean gestational week at which surgery was performed was 17.7±11.3. Among the surgical indications, the most common cause is appendicitis, with 45 patients (75%). Emergency surgery was performed in 88.3% of the pregnant women. The mean hospital stay was 3.3±3.2 days and the mean week to delivery was 21.1±8.6. The mean gestational week of the pregnant women at labor was 37.8±2.8. Laparotomy preference was found to be significantly higher than laparoscopy in patients who underwent emergency surgery (p=0.007). There was no difference in pregnancy outcomes and neonatal outcomes in the laparotomy and laparoscopy groups.

Conclusion Non-obstetric surgery during pregnancy may not lead to an increase in adverse pregnancy and neonatal outcomes. In addition, there was no significant difference between the laparotomy and laparoscopy groups in terms of pregnancy and neonatal outcomes. More extensive studies are needed on this subject.

Keywords Laparoscopy during pregnancy, non-obstetric surgery, surgery in pregnancy

Özet

Amaç *Gebelik sırasında yapılan non-obstetrik cerrahilerde gebeliğin devamı ve neonatal sürecin nasıl etkileyeceği hem gebe hem cerrah tarafından önem arz etmektedir. Non-obstetrik cerrahiler ile ilgili çalışmalar sınırlı sayıdadır. Bu çalışmamızın amacı non-obstetrik cerrahi sonrası maternal ve fetal sonuçların değerlendirilmesidir.*

Gereç ve Yöntem *Çalışmamız tersiyer bir merkez olan hastanemizin obstetri kliniğimizde Ocak 2015-Ağustos 2020 tarihleri arasındaki non-obstetrik cerrahi yapılan 60 gebe hastanın retrospektif değerlendirilmesini içermektedir. Hasta bilgilerine elektronik sistem ve arşiv dosyalarından ulaşıldı. Hastaların demografik özellikleri, cerrahi yapılan hafta, takipleri, gebelik ve neonatal sonuçları değerlendirildi.*

Bulgular *Hastaların ortalama yaşı 27,9±4,42, cerrahi yapılan gebelik haftası ortalama 17,7±11,3 idi. Cerrahi endikasyonlar arasında en sık neden 45 hasta ile (%75) apandisittir. Gebelerin %88,3'üne acil cerrahi yapıldı. Ortalama hastanede kalış süresi 3,3±3,2 gün, doğuma kadar geçen ortalama hafta 21,1±8,6 idi. Gebelerin ortalama doğum haftası 37,8±2,8 idi. Acil cerrahi yapılan hastalarda laparotomi tercihi laparoskopiye göre anlamlı olarak yüksek bulundu (p=0,007). Laparotomi ve laparoskopi grubunda gebelik sonuçları ve neonatal sonuçlar açısından fark saptanmadı.*

Sonuç *Gebelikte geçirilen non-obstetrik cerrahi olumsuz gebelik ve neonatal sonuçlarda artışa yol açtığına dair bir sonuca ulaşılamamıştır. Ayrıca cerrahi şeklini değerlendirdiğimizde; laparotomi ve laparoskopi yapılan gruplar arasında gebelik ve neonatal sonuçlar açısından anlamlı bir fark bulunmadı. Bu konuda daha geniş çaplı çalışmalara ihtiyaç vardır.*

Anahtar Kelimeler *Gebelikte laparoskopi, non-obstetrik cerrahi, gebelikte cerrahi*

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INTRODUCTION

During a normal pregnancy, there are significant anatomical, physiological, and functional changes. This situation can lead to occasional different pathognomonic findings and require decisions regarding non-obstetric surgery during pregnancy, deviating from the known norms.

Suspected appendicitis during pregnancy is one of the most common indications for abdominal surgery during pregnancy.[1,2] Although the likelihood of a perforated appendix is higher in the later stages of pregnancy, acute appendicitis is more frequently observed in the second trimester (42%), as compared to the first (32%) and third trimesters (26%).[3]

In a study, it was observed that pregnant women with complicated appendicitis have a five-fold higher risk of surgical complications compared to pregnant women with simple appendicitis.[4] In the presence of supporting diagnostic findings for appendicitis, appendectomy should be performed in terms of maternal and fetal mortality and morbidity. While laparoscopic surgery is the most commonly preferred method in non-pregnant women, in pregnant women, laparoscopic surgery is more frequently chosen in the first and second trimesters, while an open surgical approach is preferred in the third trimester.[4] In cases of appendicitis during the third trimester, unless there is a life-threatening condition such as sepsis for both the mother and the fetus, there is no indication for a cesarean section.

One of the non-obstetric surgical indications in pregnancy is leiomyoma. The most significant indicators considered when making the decision for myomectomy during pregnancy are acute pelvic pain unresponsive to medical treatment for 72 hours, rapid growth of the myoma raising suspicion of a potential malignant condition, compression of pelvic organs caused by the myoma mass, and threats to the pregnancy such as fetal compression syndrome, oligohydramnios, intrauterine growth restriction (IUGR), bleeding, and abnormal placental implantation.5,6 However, myomectomy performed during pregnancy can lead to adverse pregnancy outcomes such as miscarriage (18-35%), preterm birth, infection, and uterine dehiscence due to uterine manipulations involved in the procedure.[5]

While the incidence of complications reported with conservative treatment varies within a wide range of 3-38%, it has been reported that untreated uterine myomas result in worse pregnancy outcomes compared to surgically treated myomas.[7] While laparotomic myomectomy was considered safe for complicated pregnancies involving leiomyomas until the end of the 19th century, recent studies have indicated that laparoscopic myomectomy should be considered as the first choice for abdominal and pelvic surgery during pregnancy, regardless of gestational age. The main reasons for preferring laparoscopy over laparotomy are the provision of better intraabdominal visualization, minimal invasive approach, and the possibility of early mobilization after surgery.[8]

Tubo-ovarian abscess (TOA) is a rare non-obstetric surgical cause during pregnancy, attributed to the prevention of ascending infection by the cervical mucus plug and the amniotic membrane.[9,10] When the decision for surgery is made for TOA, although laparoscopy can be challenging in the third trimester due to the enlarged size of the uterus, it can be performed either through laparotomy or laparoscopy depending on the surgeon's experience.

The incidence of acute cholecystitis during pregnancy is rare, ranging from 1 to 6 per 10.000 pregnancies. It is the second most common non-obstetric surgical cause for abdominal pain during pregnancy.[11] It is frequently observed due to a two-fold increase in the volume of the gallbladder and delayed complete emptying of the gallbladder during pregnancy.[12] Cholecystectomy can be safely performed in all trimesters.

Although intestinal obstruction is rare during pregnancy,

the mortality rates associated with obstruction are high. The main reasons for this are delayed diagnosis and a preference for conservative management over surgery.[13]

The aim of this study is to evaluate maternal and fetal outcomes following non-obstetric surgery.

MATERIAL and METHOD

Our retrospective cohort study was conducted at Istanbul Kanuni Sultan Suleyman Training and Research Hospital, Health Sciences University, between January 2015 and August 2020. Ethical approval was obtained from the ethics committee of Istanbul Kanuni Sultan Suleyman Training and Research Hospital, Health Sciences University, (Approval No: KAEK/2020.08.175) (03/09/2020). A total of 60 patients with complete medical records were included in the study. Patients' ages, body mass indexes, existing medical conditions, smoking status, gravidity, parity, gestational weeks at the time of surgery, length of hospital stay, type of surgery undergone, gestational weeks at delivery, pregnancy complications, use of tocolysis, pregnancy outcomes, neonatal outcomes, and the need for repeat surgery were recorded.

The mode of delivery, indication for birth, indication for cesarean section, birth weights of newborns, 1st and 5th minute Apgar scores, need for neonatal intensive care, length of hospital stay, and possible complications were recorded. Infants with estimated birth weight below the 3rd percentile were considered intrauterine growth restriction (IUGR). Low birth weight (SGA) was defined as birth weight <2500 g, and very low birth weight (VLBW) as <1500 g. Poor neonatal outcome was defined as 1) fetal or neonatal death, 2) admission to the neonatal intensive care unit (NICU), or 3) APGAR score at 5 minutes <7. Birth occurring before 37 weeks of gestation was classified as preterm birth, and between 34-37 weeks as late preterm birth. Patients diagnosed with preterm labor received betamethasone treatment, and those diagnosed with preterm labor below 32 weeks were given neuroprotective MgSO4 1g/hour for 24 hours.

The inclusion criteria for the study consisted of pregnant women between the ages of 18 and 45 who underwent non-obstetric surgery and were followed up in our hospital. Pregnant women under the age of 18, over the age of 45, pregnant women who underwent surgery for obstetric reasons, and patients who underwent non-obstetric surgery in our hospital but were not followed up were determined as exclusion criteria for the study.

SPSS 22.0 (IBM, IL Chicago) was used for statistical analysis. Categorical data were presented as n (%) and continuous variables as mean±standard deviation (SD), while non-normally distributed parametric data were defined as median (minimum-maximum). The normality of the data was assessed using the Kolmogorov-Smirnov test. The chi-square test was used for the comparison of categorical variables, and the student t-test was used for the comparison of normally distributed parametric variables. The Mann-Whitney U test was used for the comparison of non-normally distributed parametric variables. A p-value of <0.05 was considered statistically significant.

RESULTS

The mean age of our patients was 27.9±4.42, and the mean body mass index (BMI) was 26.1±4.2 kg/m2. A history of previous cesarean section was present in 25% of the pregnant women. The average gestational week at the time of surgery was 17.7±11.3. 88.3% of patients underwent emergency surgery. Of these, 23.3% underwent laparoscopy, while 71.7% underwent laparotomy. In 5% of the cases, conversion from laparoscopy to laparotomy was occurred during the surgery. Additionally, one pregnant woman who could not be diagnosed with appendicitis went into preterm labor at 29 weeks and 2 days of gestation and delivered vaginally. She underwent laparoscopy for perforated appendicitis on the second postpartum day. The demographic characteristics of the patients are summarized in Table 1.

Table 1. Demographic characteristics of the patients.	
Number of patients (n=60)	
Maternal age (years)	27.9±4.4
Smoking (Yes)	10 (16.7%)
BMI (kg/m2)	26.1±4,2
Gravidity	2.6±1.4
Parity	1.3±1.2
History of cesarean section	15 (25%)
Patients with multiple pregnancies	2 (3.3%)
History of abortion	10 (16.7%)
Comorbidity	13 (21.7%)
Gestational age at the time of surgery	17.7±11.3
Patients underwent emergency surgery	53 (88.3%)
Laparoscopy	14 (23.3%)
Laparotomy	43 (71.7%)
Conversion from laparoscopy to laparotomy	3 (5%)

The postoperative characteristics of the patients are shown in Table 2. Surgical complications developed in 13.3% of the patients, and the average length of hospital stay was 3.3±3.2 days. The mean weeks from surgery to the delivery was 21.1±8.6, and the average gestational week at birth was 37.8±2.8. Forty-five percent of the patients gave birth by cesarean section.

Table 2. Follow-up characteristics of patients.		
	Mean or %	Median
Decrease in hemoglobin(mg/dl)	0.4±0.6	0,1 (0-2.7)
Decrease in hematocrit	2.0±2.5	0.9 (0-8.8)
Patients who required blood transfusion	2 (3.3%)	
Surgical complications	8 (13.3%)	
Length of hospital stay (days)	3.3±3.2	2.5 (1-27)
Patients received tocolysis	28 (46.7%)	
Patients diagnosed with preterm labor	38 (63.3%)	
Weeks elapsed from surgery to delivery	21.1±8.6	21.7 (4-38.6)
Gestational age at birth	37.8±2.8	38 (28-42)
Those who had a cesarean delivery	27 (45%)	

The distribution of diagnoses for pregnant women undergoing non-obstetric surgery is shown in Figure 1. Among the patients, appendicitis was the most common non-obstetric surgical indication, accounting for 75% (45 patients). Other reasons included adnexal torsion in 5 patients (8.3%), adnexal torsion with ovarian cyst in 5 patients (8.3%), cholecystitis in 2 patients (3.3%), uterine myoma in 1 patient (1.7%), volvulus with appendicitis in 1 patient (1.7%), and ruptured ovarian cyst in 1 patient (1.7%).

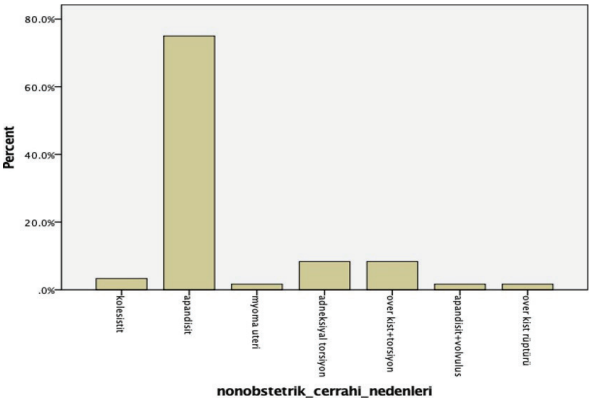

Figure 1. Distribution of diagnoses in pregnant women undergoing non-obstetric surgery.

The frequency of trimesters during which pregnant women underwent non-obstetric surgery is shown in Figure 2. It was observed that surgery was most commonly performed in the second trimester, accounting for 50% (30 patients).

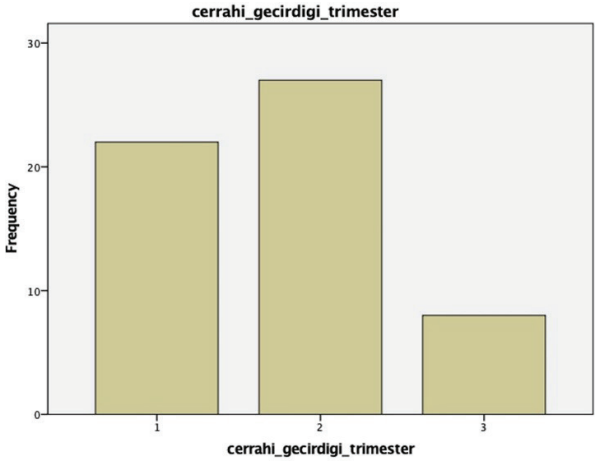

Figure 2. Trimesters of non-obstetric surgery in pregnant women undergoing surgery.

The patients' demographic characteristics were reclassified into two main categories: those who underwent laparoscopy and those who underwent laparotomy. The comparison of demographic characteristics of two groups is shown in Table 3. There was no significant difference observed between the two groups regarding these demographic characteristics. The median gestational age at the time of surgery was 16.7 weeks (6.3-33.3) in the laparoscopy group and 16.2 weeks (2-37.4) in the laparotomy group. Laparotomy rates were found more higher than laparoscopy rates in patients with emergency surgery (95.3% vs 64.3%, p=0.007).

Table 3. Comparison of demographic characteristics of patients undergoing laparoscopy and laparotomy.

Number of patients (n=60)	Laparoscopy (n=14)	Laparotomy (n=43)	p
Maternal age (years)	27 (20-33)	27 (21-39)	0.40
Smoking (Yes)	2 (14.3%)	8 (18.6%)	0.69
BMI (kg/m2)	26 (17-33)	26 (21-37)	0.32
Gravidity	3 (1-5)	2 (1-7)	0.77
Parity	1 (0-4)	1 (0-5)	0.48
Multiparity	9 (64.3%)	30 (70%)	0.61
History of cesarean section	5 (35.7%)	9 (21%)	0.11
Patients with multiple pregnancies	1 (7.1%)	1 (2.3%)	0.43
History of abortion	3 (21.4%)	6 (14%)	0.67
Comorbidity	3 (21.4%)	10 (23.3%)	0.46
Gestational age at the time of surgery	16.7 (6.3-33.3)	16.2 (2-37.4)	0.79
Patients underwent emergency surgery	9 (64.3%)	41 (95.3%)	0.007

BMI: Body mass index

The comparison of postoperative follow-up parameters between patients who underwent laparotomy and laparoscopy is shown in Table 4. There was no significant difference between the two groups regarding hemoglobin decrease and blood transfusion rates.

There was no difference between laparoscopy and laparotomy groups regarding median gestational week, the time interval from surgery to delivery. In the laparoscopy group, 8 patients (57.1%) received tocolysis treatment, 12 patients (85.7%) had no postoperative complications, 7 patients (50%) had preterm labor, 9 patients (64.3%) had no pregnancy complications, and 9 patients (64.3%) had a cesarean section. In the laparotomy group, 19 patients (44.2%) received tocolysis treatment, 37 patients (86%) had no postoperative complications, 28 patients (65.1%) had preterm labor, 27 patients (63%) had no pregnancy complications, and 16 patients (37.2%) had a cesarean section. There was no significant difference between the two groups in terms of these characteristics.

Table 4. Comparison of follow-up outcomes between patients undergoing laparotomy and laparoscopy.

	Laparoscopy (n=14)	Laparotomy (n=43)	p
Gestational age at birth	38 (28-41)	38 (29-42)	0.08
Weeks elapsed from surgery to delivery	20.5 (4-31.4)	22 (6.5-38.6)	0.56
Decrease in hemoglobin	0.2 (0-2.7)	0.1 (0-2.2)	0.30
Decrease in hematocrit	0.9 (0-7.7)	1.2 (0-8.8)	0.81
Length of hospital stay (days)	2.5 (1-22)	3 (1-10)	0.73
Patients who required blood transfusion	1 (7.1%)	1 (2.3%)	0.43
Patients received tocolysis	8 (57.1%)	19 (44.2%)	0.39
Those without perioperative complications	12 (85.7%)	37 (86%)	0.97
Those without pregnancy complications	9 (64.3%)	27 (63%)	0.67
Those who had a cesarean delivery	9 (64.3%)	16 (37.2%)	0.09

The comparative analysis of pregnancy complications in the laparotomy and laparoscopy groups is presented in Table 5. In the laparoscopy group, it was observed that the number of cases of preterm labor was 7 (50%), intrauterine growth restriction (IUGR) was present in 1 patient (7.1%), and sepsis was present in 1 patient (7.1%). In the laparotomy group, the number of cases of preterm labor was 28 (65.1%), placenta previa totalis was present in 1 patient (2.3%), IUGR was present in 2 cases (4.6%), pelvic dilatation was present in 1 patient (2.3%), gestational hypertension was present in 2 patients (4.6%), and preterm labor was accompanied by pelvic dilatation in 1 patient (2.3%).

Table 5. Pregnancy complications in the laparotomy and laparoscopy groups

	Laparoscopy (n=14)	Laparotomy (n=43)	p
Preterm labor	7 (50%)	28 (65.1%)	0.058
Placenta previa totalis	-	1 (2.3%)	-
IUGR	1 (7.1%)	2 (4.6%)	-
Pelviectasis	-	1 (2.3%)	-
Gestational hypertension	-	2 (4.6%)	-
Preterm labor + Pelviectasis	-	1 (2.3%)	-
Sepsis	1 (7.1%)	-	-

IUGR: Intrauterine growth restriction

The comparison of neonatal outcomes in the laparotomy and laparoscopy groups is shown in Table 6. In the laparoscopy group, the median birth weight was 2915 g (1025-4500), the median neonatal pH was 7.3 (7.0-7.3). There were 4 cases of small for gestational age (SGA) infants (28.6%), 5 newborns (35.7%) required neonatal intensive care unit (NICU) admission, and there were 14 live births (100%), with no cases of abortion or elective curettage. In the laparotomy group, the median birth weight was 3160 g (1380-4260), neonatal pH was 7.4 (range: 7.3-7.4), there were 4 cases of SGA infants (9.3%), 5 newborns (11.6%) required NICU admission, and there were 40 live births (93%). There was no significant difference in neonatal outcomes between the laparoscopy and laparotomy groups. No abortions were observed in the laparoscopy group, while 3 patients (7%) had abortion in the laparotomy group. In the group where laparoscopy was converted to laparotomy, 3 cases resulted in live births. Two pregnancies reached term, while one pregnancy underwent surgery at 20 weeks and delivered a live birth at 28 weeks after 8 weeks.

Table 6. Comparison of neonatal outcomes in the laparotomy and laparoscopy groups.

	Laparoscopy(n=14)	Laparotomy (n=43)	p
Birth weigth (g)	2915 (1025-4500)	3160 (1380-4260)	0.29
Neonatal ph	7.3 (7.0-7.3)	7.4 (7.3-7.4)	0.48
SGA	4 (28.6%)	4 (9.3%)	0.18
NICU	5 (35.7%)	5 (11.6%)	0.09
Live birth	14 (100%)	40 (93%)	0.47
Abortion	0 (0.0%)	3 (7%)	

NICU: Neonatal intensive care unit, SGA: Small for gestational age

DISCUSSION

The management of non-obstetric surgery in pregnant patients should be determined with a multidisciplinary approach involving obstetricians, general surgeons, anesthesiologists, and neonatologists. The main reason for this is the need for a careful assessment of the risk-benefit ratio regarding the maternal and fetal outcomes of non-obstetric surgery performed on pregnant patients. This is because when a surgical decision is made, the medical benefits of both maternal and fetal outcomes should outweigh the risks. Surgical, anesthetic, and perioperative management during pregnancy require special knowledge and experience due to their differences from non-pregnant patients.

In our study, the most common indication for non-obstetric surgery was appendicitis, accounting for 75% of cases, which is consistent with a study conducted by Prodromidou et al. in 2018.[14] The frequency of surgical indications in our study was also similar to Results of a study by Vujic et al.[15] A delayed diagnosis of perforated appendicitis can lead to sepsis, resulting in preterm birth, miscarriage, intrauterine fetal death, as well as maternal mortality and morbidity. In a study by Aggenbach et al. reported that patients who underwent surgery with suspected appendicitis but were found not to have appendicitis had a risk of preterm birth of 26% and a fetal loss risk of 3-7.3%.[16] We identified a pregnant patient who delivered prematurely at 29 weeks+2 days and underwent laparoscopic surgery for perforated appendicitis on the 2nd postpartum day.

The second most common non-obstetric surgical reason in pregnancy was adnexal torsion, accounting for 16.6% of cases. When adnexal torsion is diagnosed late, it can lead to adnexal necrosis and is considered an important gynecological emergency. Koo et al. compared two groups of women who underwent laparotomy and laparoscopy, and the mean gestational age and birthweight of the babies were found to be similar between the two groups. The rate of preterm birth was 8.6% in the laparotomy group, while it was 1.7% in the laparoscopy group.[17]

Two of our patients underwent laparoscopy due to cholelithiasis. One patient underwent laparoscopy in the 2nd trimester, and the other in the 3rd trimester. Similarly to our study, Date et al. reported that out of 19 patients who underwent laparoscopic cholecystectomy, only one reported complications. They reported that there was no increase in the risk of preterm labor or fetal death with an operative approach compared to conservative management. Conversely, in conservatively treated patients, the rate of fetal death due to gallstone pancreatitis was significantly higher.[18]

Of our patients, 38.6% underwent surgery in the first trimester, 47.4% in the second trimester, and 14% in the 3rd trimester. The American Society of Gastrointestinal Endoscopic Surgeons reported in 2011 that laparoscopy is feasible in every trimester.[19] If elective surgery is to be performed, it is particularly suitable to perform laparoscopy in the second trimester. Performing surgery in the 1st trimester increases the risk of abortion, while performing it in the 3rd trimester increases the likelihood of preterm labor.[20] Additionally, Fong et al. reported in their study that surgery should be avoided as much as possible in the 3rd trimester.[21]

In conclusion, our study found a low rate of postoperative complications after non-obstetric surgery during the pregnancy, indicating the safety of surgical treatment when necessary during pregnancy. Despite the high incidence

of preterm labor, the mean gestational age at delivery was found to be within the normal range following the surgery. Due to the relatively small number of total patients in our study, further research and data are needed to reach a consensus on the safety and management of non-obstetric surgery during pregnancy.

Acknowledgment

We thank Istanbul Kanuni Sultan Suleyman Training and Research Hospital, Health Sciences University, Department of Obstetrics and Gynecology, for his help in designing this study.

Ethical Approval

Istanbul Kanuni Sultan Suleyman Training and Research Hospital, Health Sciences University, Ethics Committee and following the Declaration of Helsinki (decision no: KAEK/2020.08.175, date: 03/09/2020).

Peer-review

Externally and internally peer-reviewed.

Author Contributions

Data curation, collection and reviewing: A.O., Conceptualization, methodology: A.O., S.Y., Z.O.G., I.O., Data analysis and interpretation: A.O., S.Y., Writing: A.O., S.Y., Reviewing and editing: A.O, S.Y., Z.O.G., I.O.

Conflict of Interest

The authors declare that they have no conflict of interest.

Funding

This study received no financial support.

Informed Consent

Retrospective study.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Limitations of the Study

This study was conducted in a single center and with a small number of patients.

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