The Prevalence of Non-Obstetric Surgical Procedures in Pregnant Women at Ba'ath Hospital in Hamadan and Their Pregnancy Outcomes

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Abstract:

Background and Objective: **The prevalence of non-obstetric surgeries in pregnant women remains unclear, and there is a lack of information regarding the consequences and complications of such procedures. This lack of clarity may lead some surgeons to perform non-obstetric surgeries on pregnant women, potentially resulting in complications for both the mother and fetus. Therefore, this study aimed to investigate the prevalence of non-obstetric surgeries in pregnant women and their related complications on pregnancy outcomes at Ba'ath Hospital in Hamadan between 2012 and 2016.**

Materials & Methods: **This cross-sectional descriptive study involved 45 pregnant women who underwent non-obstetric surgeries at Ba'ath Hospital of Hamedan University of Medical Sciences during the specified period. Data regarding the type of surgery, surgical outcomes for both mother and baby, and surgical complications were recorded for each participant.**

Results: **In this study, 45 pregnant women with a mean age of 28.13 ± 6.77 years and a mean gestational age of 19.20 ± 8.97 weeks participated. The most common causes of surgery were trauma and limb fractures (ranked first) and appendicitis (ranked second). Among the surgeries performed, only one was laparoscopic, and all were emergency procedures. The most common complications among the 45 women who underwent non-obstetric surgeries were a change in delivery method (from vaginal to cesarean) and miscarriage. A total of 7 cases of miscarriage were observed, with some occurring following trauma surgeries, burn surgeries, and cerebral hemorrhage. Additionally, one case of preterm delivery at 37 weeks by cesarean section occurred following orthopedic surgery after a limb trauma.**

Conclusion: **The results of this study indicated that trauma and limb fractures were the most common causes of non-obstetric surgeries in pregnant women. The majority of surgeries were emergency procedures, with only one performed laparoscopically. The most significant complications following surgery included a change in the delivery method from vaginal to cesarean and miscarriage. Miscarriages were observed in some cases following surgeries related to trauma, burns, and cerebral hemorrhage.**

***Keywords:** Surgery, Pregnancy, Non-Obstetrics, Consequences*

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Background and Objectives

Pregnancy, a physiological state characterized by profound anatomical and physiological changes, presents unique challenges in managing medical conditions requiring surgical intervention. Non-obstetric surgeries in pregnant women create a distinct clinical scenario that necessitates careful consideration.[1] The prevalence of non-obstetric surgeries during pregnancy is steadily increasing due to various factors, including advancements in medical care, the aging maternal population, and the rising incidence of pre-existing medical conditions among pregnant women.[2]

The prevalence of non-obstetric surgeries during pregnancy varies depending on factors such as population demographics, availability of healthcare resources, and underlying medical conditions of pregnant women.[3] Studies have reported a wide range of prevalence rates, with estimates indicating that 0.75% to 2% of all pregnancies are affected by non-obstetric surgeries. However, the actual prevalence may be higher due to underreporting and the lack of comprehensive data in some regions.[4-6]

Various types of non-obstetric surgeries may be performed during pregnancy, ranging from minor procedures such as dental work and appendectomies to more complex surgeries like cholecystectomies and orthopedic procedures.[7] The most common indications for non-obstetric surgeries during pregnancy include appendicitis, cholecystitis, trauma, and malignancies.[8] Additionally, pregnant women with pre-existing medical conditions such as cardiovascular diseases, gastrointestinal disorders, and renal diseases may require surgical intervention to manage acute exacerbations or complications.[9]

The decision to perform non-obstetric surgeries during pregnancy is often guided by a balance between the potential risks to the mother and fetus versus the benefits of timely intervention for the underlying medical condition.[10] Numerous factors influence this decision-making process, including the urgency of the surgery, gestational age of the fetus, maternal status, and the expertise of the healthcare team.[11]

In cases of acute surgical emergencies such as appendicitis, cholecystitis, or trauma, prompt surgical intervention may be necessary to prevent maternal complications and mortality. Delaying surgery in such situations can lead to complications like sepsis or organ dysfunction, posing significant risks to both the mother and fetus.[12] Therefore, timely diagnosis and surgical management are crucial for optimizing outcomes in pregnant women requiring emergency surgery.[13] Similarly, pregnant women with pre-existing medical conditions may experience complications that necessitate surgical intervention during pregnancy.[14] For example, women with congenital heart disease, rheumatic heart disease, or pulmonary hypertension may require cardiac surgery or interventional procedures. Likewise, pregnant women with gastrointestinal disorders such as inflammatory bowel disease, peptic ulcer disease, or gallbladder disease may experience exacerbations requiring surgical treatment.[15] Non-obstetric surgeries during pregnancy carry inherent risks for both the mother and fetus, which must be carefully weighed against the potential benefits of surgery. Maternal complications may include issues related to anesthesia, surgical complications, postoperative infections, thromboembolic events, and exacerbation of pre-existing conditions. Additionally, surgeries involving the abdominal or pelvic region may increase the risk of preterm labor, uterine contractions, placental abruption, and fetal distress.[16-18]

Anesthesia-related complications are a significant concern during non-obstetric surgeries in pregnant women. Physiological changes in pregnancy, including increased cardiac output, decreased systemic vascular resistance, and compression of the inferior vena cava by the uterus, can impact hemodynamic stability during anesthesia induction and maintenance. Therefore, careful attention to hemodynamic monitoring, fluid management, and maternal positioning is essential to ensure favorable outcomes for both the mother and fetus.[15]

Surgical complications such as bleeding, infection, organ injury, and adhesion formation can occur during non-obstetric surgeries in pregnant women. However, managing these complications can be complex due to the need to balance maternal well-being with fetal survival. For example, the use of certain medications, imaging techniques, or surgical procedures may need to be modified to minimize fetal exposure to potential teratogens or radiation.[16] Postoperative infections are a significant concern following non-obstetric surgeries in pregnant women, as maternal immune suppression and altered wound healing mechanisms during pregnancy increase the risk of surgical site infections. Preventive measures such as postoperative antibiotic administration, aseptic surgical techniques, and postoperative wound care are essential to reduce the incidence of infections and mitigate their impact on maternal and fetal health.[17]

Thromboembolic events, including deep vein thrombosis and pulmonary embolism, are a leading cause of maternal mortality during pregnancy and the postpartum period. Pregnant women undergoing non-obstetric surgery are at increased risk of thromboembolic complications due to venous stasis, hypercoagulability, and endothelial dysfunction associated with pregnancy. Therefore, pharmacological thromboprophylaxis, early mechanical thromboprophylaxis, and compression devices are recommended to prevent venous thromboembolism in this population.[18]

Exacerbation of pre-existing conditions represents another potential complication of non-obstetric surgeries in pregnant women, particularly in those with pre-existing cardiovascular, respiratory, or autoimmune diseases. Surgical stress, anesthesia, and postoperative pain management can trigger acute decompensation or exacerbation of chronic conditions, necessitating close monitoring and multidisciplinary management by obstetricians, surgeons, anesthesiologists, and other specialists.[19]

The effects of non-obstetric surgeries on fetal growth and neonatal outcomes depend on various factors, including gestational age at the time of surgery, type of surgical procedure, maternal and fetal physiology, and postoperative care management. While most non-obstetric surgeries performed during pregnancy do not result in adverse fetal outcomes, certain factors may increase the risk of fetal complications.[20]

The timing of non-obstetric surgeries during pregnancy is a critical determinant of fetal outcomes. Surgeries performed in the first trimester, during organogenesis, carry the highest risk of teratogenicity and fetal loss. Therefore, elective surgeries should ideally be postponed until after the first trimester to minimize potential harm to the developing fetus. However, in cases of urgent or emergency surgery, the risks and benefits of surgical intervention must be carefully weighed against potential fetal risks.[21]

The type and complexity of the surgical procedure also impact fetal outcomes. Procedures involving the abdominal or pelvic cavities, such as appendectomies, cholecystectomies, or gynecological surgeries, may pose a higher risk of fetal complications due to the proximity of the surgical site to the uterus and placenta. Maternal positioning, intraoperative monitoring, and fetal monitoring techniques such as ultrasound or fetal heart rate monitoring may be employed to minimize the risk of fetal injury or compromise during surgery.[15]

Maternal and fetal physiology play a crucial role in determining the impact of non-obstetric surgeries on fetal health. Placental transfer of medications, anesthetic agents, and other substances administered during surgery can affect fetal growth and function. Therefore, the use of drugs with known teratogenic effects should be avoided or used with caution, and fetal monitoring before, during, and after surgery should be conducted to assess fetal well-being and detect signs of fetal distress. Postoperative care management, including anesthesia, fluid resuscitation, pain control, and postoperative monitoring, can significantly influence neonatal outcomes.[13]

Anesthetic techniques that minimize fetal exposure to volatile agents and opioids are preferred during non-obstetric surgeries in pregnant women. Regional anesthesia techniques such as epidural or spinal anesthesia may be used when feasible to provide maternal analgesia while minimizing fetal exposure to systemic medications.[14]

Given the unclear prevalence of non-obstetric surgeries and the associated outcomes and complications, some surgeons may perform non-obstetric surgeries in pregnant women, potentially leading to adverse maternal and fetal outcomes. Therefore, this study aimed to investigate the prevalence of non-obstetric surgeries in pregnant women and the associated complications on pregnancy outcomes among pregnant women referred to Ba'ath Hospital in Hamadan during the period 2013-2017.

Materials and Methods

Study Design

The present study is a descriptive-analytical study (with a prospective approach) that examines the prevalence and outcomes of non-obstetric surgeries in pregnant women who underwent surgery between 2013 and 2017 at Ba'ath Hospital, affiliated with Hamadan University of Medical Sciences. The study adhered to inclusion and exclusion criteria.

Eligibility Criteria

The primary inclusion criteria for the study were pregnancy, undergoing surgery, recording information related to the type of surgery, and documenting final pregnancy outcomes, as well as consent to participate in the study. The main exclusion criteria included women who underwent surgery at other centers and were referred to Ba'ath Hospital, those with underlying medical conditions, and cases where necessary information was unavailable until the end of pregnancy.

Sample Size Estimation and Sampling

Since a census sampling method was used for this study, all pregnant women from the beginning of 2013 to the end of 2017 were included and examined. Based on this sampling method, 45 pregnant women were included in the study, and their data were utilized.

Methodology

The study was conducted after approval by the Ethics Committee of Hamadan University of Medical Sciences (IR.UMSHA.REC.1397.365). A data collection form was designed and developed specifically for the purposes of this research. This form included information such as maternal age, gestational age, pregnancy status, gravidity, maternal underlying conditions (diabetes mellitus, gestational diabetes, chronic hypertension, pregnancy-induced hypertension, hypothyroidism, renal dysfunction, hepatic dysfunction, cardiovascular diseases, and respiratory diseases), history of medication use, urgency of surgery (emergency or elective), surgical method (open or laparoscopic), type of surgery (appendectomy, cholecystectomy, cholecystectomy with CBD exploration and T-tube placement, cholecystectomy with CBD exploration and choledochoduodenostomy, etc.), preoperative test results, blood transfusion (before, during, or after surgery, or none), postoperative complications, readmission, pregnancy-related information (occurrence of miscarriage after surgery, preterm delivery after surgery, fetal status after delivery), type of delivery (vaginal or cesarean), and neonatal status (healthy or with issues). The form was completed by the third author of the study and supervised by the first author.

Statistical Analysis

All data were entered into Excel and SPSS version 25. Data were presented using frequency, percentage, mean, and standard deviation, and then tables and charts were used to display the information.

Findings

In this study, 45 pregnant women with a mean age of 28.13 ± 6.77 years and a mean gestational age of 19.20 ± 8.97 weeks participated. The youngest participant was 14 years old, and the oldest was 41 years old. The minimum gestational age was 4 weeks, and the maximum was 36 weeks. None of the participants had underlying conditions such as hypertension, diabetes mellitus, etc.

An examination of the underlying causes leading to surgery revealed that trauma and limb fractures were the most common, followed by appendicitis. Among all surgeries performed, only one was laparoscopic, and all were emergency procedures (Table 1).

Table 1: Distribution of Underlying Causes Leading to Surgery

Causes	***Frequency***	***Percentage***
Appendicitis	*11*	*24.4%*
Cholecystitis	*4*	*8.90%*
Trauma & Orthopedic Surgeries	*23*	*51.2%*
Neurosurgery	*3*	*6.66%*
Debridement and Flap Placement Following Burns	*3*	*6.66%*
Tracheal Stenosis	*1*	*2.22%*
Type of Surgery		
Emergency	*44*	*98.8%*
Elective	*1*	*2.2%*
Surgical Method		
Open	*45*	*100%*
Laparoscopic	*0*	*0%*

The mean hospital stay duration was 5.98 ± 6.06 days, with a minimum of one day and a maximum of 39 days. Most patients were hospitalized for one to three days. Among all participants, only one patient who underwent open cholecystectomy experienced postoperative complications, developing an abscess and collection following surgery. One patient experienced intracranial hemorrhage following warfarin use and was admitted to the intensive care unit, where she died after ten days.

Of the four women who underwent cholecystectomy, one had biliary colitis without evidence of acute cholecystitis on ultrasound, two had acute cholecystitis on ultrasound, and one had pancreatitis and biliary colitis without evidence of acute cholecystitis on ultrasound.

Among the 45 women who underwent non-obstetric surgeries, the most common complications were a change in the type of delivery (from vaginal to cesarean) and miscarriage (Chart 1). Of the seven miscarriages observed, one occurred at 7 weeks, one at 8 weeks, four at 11 weeks, and one at 12 weeks. Four miscarriages followed trauma surgeries, two followed surgeries due to burns and were associated with maternal death, and one followed surgery due to intracranial hemorrhage.

One case of preterm delivery at 37 weeks via cesarean section was observed, which coincided with maternal orthopedic surgery following limb trauma. Of the twelve cesarean sections observed in this study, all were associated with multiple surgeries, including trauma, tracheal stenosis, appendicitis, and cholecystitis. Additionally, one case of a neonate with cleft palate anomaly was observed, which occurred following maternal orthopedic surgery due to trauma.

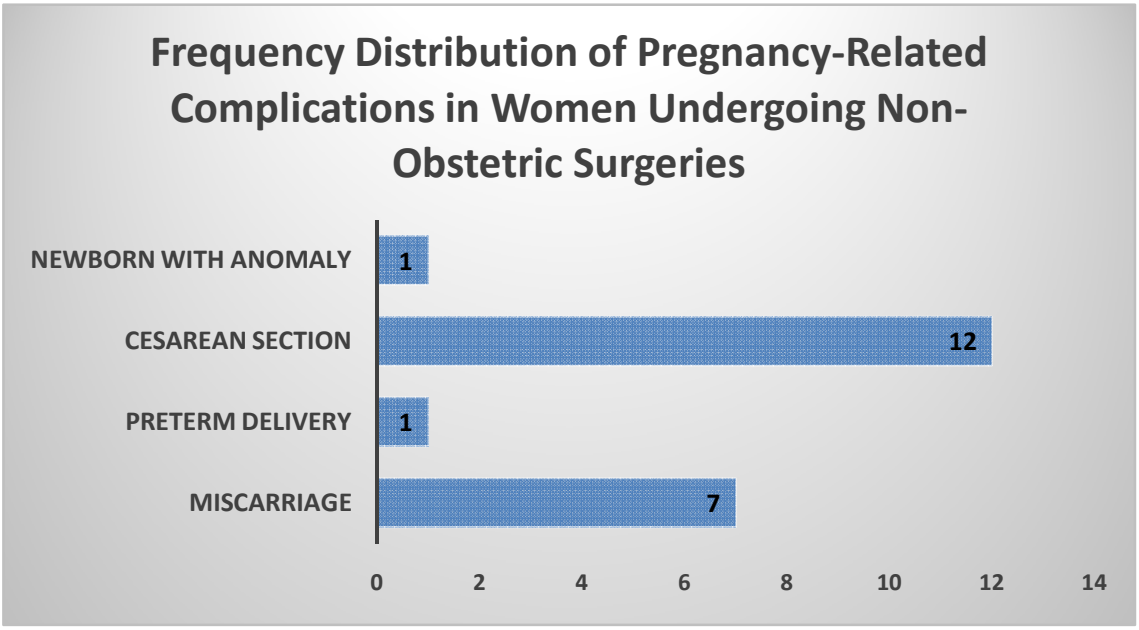

Chart 1: Frequency Distribution of Pregnancy-Related Complications in Women Undergoing Non-Obstetric Surgeries

Discussion

The results obtained from the study regarding the prevalence of non-obstetric surgeries in pregnant women and their associated complications on pregnancy outcomes likely reflect the complex interplay of physiological, medical, and surgical factors unique to the pregnant population undergoing surgical interventions. Understanding these mechanisms requires a comprehensive examination of various aspects, including physiological changes during pregnancy, the impact of pre-existing medical conditions, the nature of surgical indications, and the consequences of surgical interventions on maternal and fetal health.[11]

Similar to the findings of our study, Della Rocca et al. also highlighted that one of the key aspects influencing outcomes is the physiological changes that occur during pregnancy, which can predispose pregnant women to specific medical conditions and injuries requiring surgical intervention.[14] As reported in our study, Ouzounian et al. also noted that increased weight and changes in balance associated with pregnancy may elevate the risk of falls and traumatic injuries, leading to limb fractures and other traumatic injuries observed in this study.[15] Additionally, the displacement of abdominal organs, including the appendix, due to uterine growth can contribute to conditions such as appendicitis, which emerged as a significant surgical cause in this study. Furthermore, hormonal and metabolic changes during pregnancy may affect the musculoskeletal system, predisposing pregnant women to fractures and other orthopedic injuries.[16]

The prevalence of cholecystitis, neurosurgical procedures, and burns observed in this study, which aligns with the findings of Kuy et al., may also be influenced by physiological changes during pregnancy and pre-existing medical conditions exacerbated by pregnancy or complications arising from surgical interventions in women. For example, hormonal changes during pregnancy can affect gallbladder function, increasing the risk of gallstone formation and predisposing pregnant women to cholecystitis.[17]

Similarly, the increased risk of venous thromboembolism during pregnancy may contribute to conditions such as deep vein thrombosis or pulmonary embolism, necessitating surgical interventions like vascular or neurosurgical procedures.[18-20]

The emergency nature of most surgeries observed in this study, consistent with the findings of Ueberrueck et al., likely reflects the urgent need to address acute medical conditions or complications during pregnancy. Physiological changes and altered immune responses during pregnancy can influence the presentation and management of medical conditions, leading to situations where surgical intervention is essential to mitigate risks to maternal and fetal health. Additionally, obstetric emergencies such as placental abruption, uterine rupture, or fetal distress may require immediate surgical interventions like cesarean sections to prevent adverse pregnancy outcomes.[21]

The diversity of surgical presentations and complications observed in this study underscores the complexity of managing surgical cases in pregnant women and highlights the importance of multidisciplinary care involving obstetricians, surgeons, anesthesiologists, and other specialists. For example, the occurrence of abscess formation or intracranial hemorrhage post-surgery necessitates careful monitoring and appropriate management to prevent complications and optimize outcomes for both the mother and fetus. Furthermore, cases of fetal anomalies or preterm delivery emphasize the importance of comprehensive prenatal care and close monitoring of high-risk pregnancies to identify and address potential complications in a timely manner.[22]

The high prevalence of cesarean sections and changes in the mode of delivery observed in this study may be influenced by various factors, including obstetric indications such as fetal distress, malposition, or maternal medical conditions, as well as surgical considerations arising from non-obstetric complications. The decision to perform a cesarean section in the context of non-obstetric surgery may be guided by considerations such as the need for anesthesia, maternal or fetal compromise, or concerns about potential complications associated with vaginal delivery following recent surgery.[15]

Conclusion

In conclusion, the results of this study on non-obstetric surgeries in pregnant women and their impact on pregnancy outcomes highlight the complex interplay of physiological, medical, and surgical factors affecting maternal and fetal health during pregnancy. Understanding these mechanisms is crucial for guiding clinical practice and optimizing outcomes for pregnant women undergoing surgical interventions. Further research and collaboration among obstetricians, surgeons, and other specialists are needed to develop evidence-based guidelines and protocols for managing surgical cases in pregnant women, with the ultimate goal of improving maternal and fetal outcomes.

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