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# Acute abdomen in gynaecology: current trends

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**ABSTRACT**

**Objective.** This study aimed to assess the efficacy and safety of laparoscopic *versus* laparotomic approaches for treating acute abdominal syndrome in both pregnant and non-pregnant women, based on data from the Samarkand branch of the Republican Scientific and Practical Centre for Emergency Medical Care.

**Materials and Methods.** The study used diagnostic methods (history taking, clinical examination, ultrasound, laboratory tests), surgical interventions (laparoscopy, laparotomy), postoperative monitoring (monitoring of patients' condition, control of laboratory parameters, ultrasound), and statistical analysis of data using Student's t-test.

**Results.** The findings highlighted several benefits of laparoscopy, such as minimal invasiveness, shorter hospital stays, and a lower postoperative complication rate (5% compared to 18% for laparotomy). Additionally, laparoscopy was more effective in preserving fertility, with 89% of patients maintaining reproductive function without complications, *versus* 72% following laparotomy. However, laparotomy was still necessary in critical situations like large neoplasms or severe trauma. The study also indicated that bipolar coagulation reduced complications more effectively than monopolar coagulation, though haemostasis control issues arose in cases of ovarian rupture and tubal pregnancy. Early rehabilitation was crucial in minimizing complications, with standardized protocols proving essential. Regional anaesthesia, particularly epidural, was shown to reduce postoperative pain and promote quicker recovery, reinforcing previous research.

**Conclusions.** Laparoscopy demonstrated high efficacy and safety, underscoring the need for a multidisciplinary approach to reduce complications. Future research should focus on optimizing postoperative care and refining guidelines for selecting between laparoscopic and laparotomic methods based on specific clinical situations.

## INTRODUCTION

When diagnosing patients with symptoms of acute abdomen, both surgical and gynaecological causes must be considered, regardless of whether the woman is pregnant. Laparoscopy has had a revolutionary impact on the surgical approach in gynaecology, opening new possibilities for the

diagnosis and treatment of acute abdominal conditions. Thanks to this method, it has become possible to perform minimally invasive surgeries that previously required large incisions and significant interventions. Laparoscopic surgery allows reducing the risk of complications, speeding up the recovery process and reducing the level of pain after surgery. This is particularly relevant for pregnant patients, in whom any surgical intervention should be as safe as possible for both mother and foetus [1]. However, some cases still require traditional laparotomy. Preservation of fertility is an essential aspect of women's well-being. Acute abdomen can occur for both obstetric and gynaecological reasons, and obstetric conditions can be particularly dangerous as they can threaten the life of the mother and foetus. Non-obstetric abdominal surgery in pregnant women can be challenging both diagnostically and technically. Delay in diagnosis and timely treatment is the most common cause of unfavourable maternal and foetal outcomes [2]. The diagnosis and management of non-obstetric abdominal conditions in pregnant women is a challenge for both obstetricians and general surgeons. The percentage of pregnant women requiring surgical intervention for non-obstetric indications ranges from 0.75 to 4.8%, as shown in retrospective studies by Yu *et al.* [3] and Sachs *et al.* [4]. Most published studies on this topic are based on analyses of past cases and a few meta-analyses; randomized clinical trials defining optimal treatment approaches for this group of patients are still lacking. Okeagu *et al.* [5] developed recommendations for the management of pregnant patients after non-obstetric surgery based on the analysis of observational studies, caesarean section data and expert judgement. The main indications for surgery in pregnant women include a number of serious pathologies, among which the most common are infectious diseases such as acute appendicitis and cholecystitis. Acute appendicitis is one of the most common reasons for emergency surgery during pregnancy because its symptoms may resemble those of normal pregnancy, making early diagnosis difficult [6]. Cholecystitis, an inflammation of the gallbladder, may also require surgical intervention, especially when conservative treatment is not effective [7].

In addition to infectious diseases, pregnant women may encounter other critical situations that require urgent surgical intervention. These may be ovarian abnormalities such as cysts or tumours, which can cause pain and discomfort and require surgical treatment to avoid complications. Intestinal obstruction is also a serious indication for surgery, which may be caused by mechanical or functional abnormalities in the intestine. In cases of traumatic lesions that may occur due to accidents or cancer, prompt surgical intervention is necessary to prevent the progression of the disease. These pathologies require urgent surgical intervention and a comprehensive multidisciplinary approach to ensure maternal and foetal safety [8]. Teratogenic drugs that may adversely affect foetal development should be avoided during treatment planning. It is also important to prevent foetal acidosis and hypoxaemia, which may occur due to blood supply disturbances or metabolic changes caused by surgery. Prevention of these complications is key to reducing the risk of adverse pregnancy outcomes such as miscarriage, stillbirth, or preterm labour [9]. To date, there is no uniform recommendation on the choice between laparoscopy and open surgery in pregnant women. This issue is usually decided on the basis of the individual approach of the physician, taking into account the clinical indications and peculiarities of each specific situation. However, in cases where acute appendicitis is suspected, and the clinical situation is equivocal, the Society of American Gastrointestinal Endoscopic Surgeons recommends the laparoscopic approach as less invasive and less traumatic for pregnant women. Laparoscopy allows surgical intervention with minimal impact on the abdomen and reduced risk of complications, making it the preferred method in certain clinical cases [10].

The aim of this study is to determine current approaches to the diagnosis and treatment of acute abdominal syndrome in pregnant and non-pregnant women to reduce maternal and foetal health risks.

Objectives of the study are:

1. Conducting a systematic review of scientific articles, meta-analyses and systematic reviews published in the last ten years using major medical databases (PubMed, Scopus, Google Scholar).
2. Determining the causes of acute abdomen in pregnant and non-pregnant women, considering both surgical and gynaecological aspects.
3. Evaluating the effectiveness and accuracy of different methods of diagnosis of acute abdominal syndrome (ultrasound, laparoscopy).
4. Analysing the results of surgical interventions (laparotomy and laparoscopy) in patients with

acute abdomen and to determine the safest methods for pregnant women.
5. Evaluating postoperative outcomes and complication rates in pregnant and non-pregnant women undergoing surgical intervention.
6. Developing recommendations to improve the diagnosis and treatment of patients with acute abdomen in gynaecology, with a focus on minimizing health risks.
7. Studying and describing cases of complications encountered during emergency surgical interventions in pregnant and non-pregnant patients with acute abdominal syndrome.
8. Performing a comparative analysis of the volume of blood loss in different groups of patients during laparoscopy and laparotomy.
9. Assessing the necessity and effectiveness of rehabilitation measures for female patients after surgical interventions, aimed at minimizing the risks of complications and improving postoperative recovery.

***Theoretical overview***

Acute abdomen in gynaecology is a complex and multidimensional problem that requires a comprehensive approach to diagnosis and treatment. This concept includes a wide range of diseases and pathologies that require urgent medical intervention [11]. A literature review of this topic analyses the existing studies and scientists' views on the main aspects of acute abdomen, in particular its causes, diagnosis, and treatment. Acute abdomen in gynaecology is defined as a clinical syndrome characterized by sudden and intense abdominal pain requiring urgent medical intervention. It can be caused by both obstetric and non-obstetric causes [12].

Obstetric causes of acute abdomen include premature placental abruption, ectopic pregnancy, ovarian apoplexy and other pathologies occurring during pregnancy. Non-obstetric causes include inflammatory processes such as appendicitis, cholecystitis, and mechanical complications such as ovarian cyst inversion [13].

***Exploring obstetric causes***

Ectopic pregnancy is one of the most serious obstetric causes of acute abdomen. In conformity with Mullany *et al.* [14], ectopic pregnancy can be life-threatening and requires urgent surgical intervention to remove the ectopic pregnancy and prevent possible complications.

Ovarian apoplexy is a rupture of the ovary accompanied by intense pain and can lead to internal bleeding. As noted by Gundabattula *et al.* [15], ovarian apoplexy often requires emergency surgery to stop the bleeding and preserve ovarian function. Premature placental abruption is another serious problem that requires urgent treatment. According to Brandt and Ananth [16], premature placental abruption can cause severe complications for both mother and foetus, making timely diagnosis and treatment critical.

***Investigation of non-obstetric causes***

Acute appendicitis is one of the more common non-acute causes of acute abdomen. As noted by Mejri *et al.* [17], appendicitis in pregnant women is often diagnosed with a delay, which can lead to serious complications. They emphasize the need for early diagnosis and surgical intervention.

Ovarian cyst torsion is another important pathology that requires urgent intervention. According to Dupuis and Kim [18], cyst torsion can lead to ovarian death and serious reproductive complications, so timely diagnosis and treatment are critical. Cholecystitis in pregnant women can also cause an acute abdomen (**Figure 1**). As noted by Mahjoubi *et al.* [19], cholecystitis can be diagnosed only after excluding other possible causes of abdominal pain, such as gynaecological pathologies.

Different methods are used to diagnose acute abdomen. Ultrasound is one of the main tools for identifying obstetric and non-obstetric causes of acute abdomen.

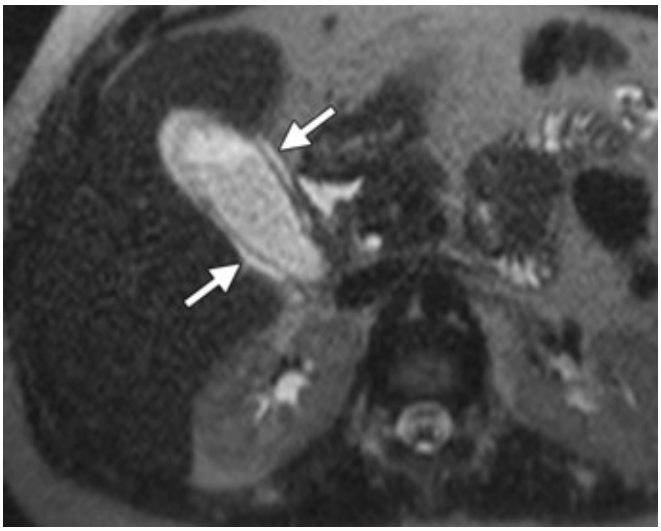

**Figure 1.** *Acute cholecystitis in a pregnant woman at 32 weeks' gesta*

Axial T2-weighted SSFSE image demonstrates acute gallbladder inflammation with wall edema (shown by arrows); adapted from 20. Spalluto LB *et al.* [20].

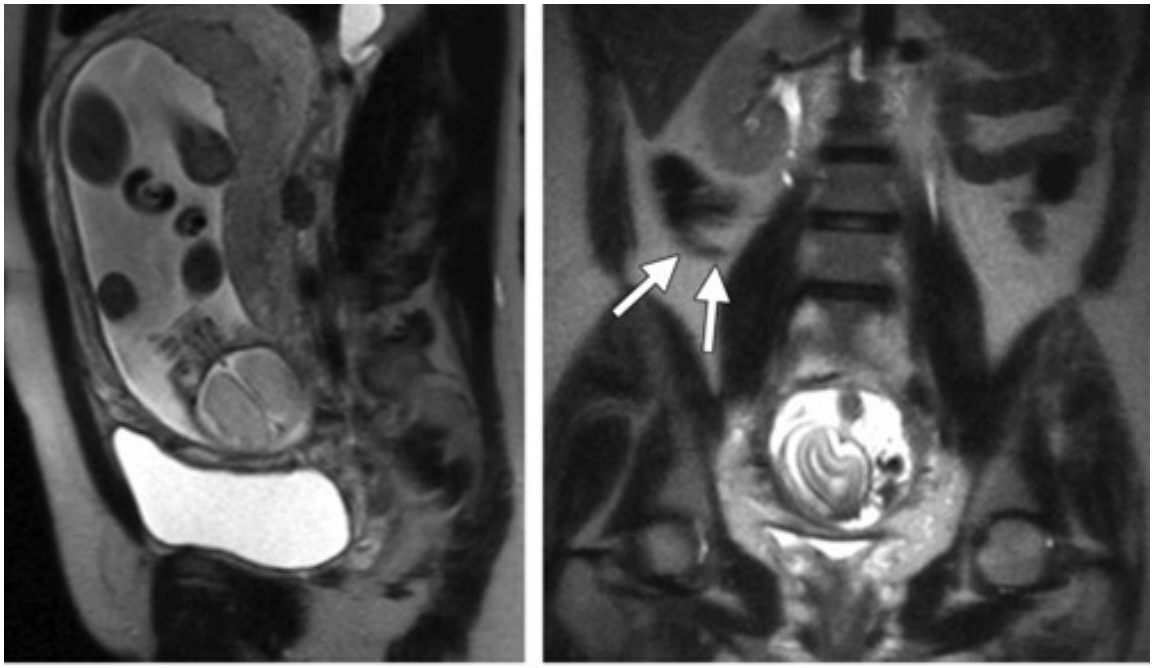


**Figure 2.** *Normal pelvis of a pregnant woman at 24 weeks of pregnancy.*

**(a)** Sagittal; **(b)** coronal T2-weighted SSFSE images demonstrate the predominance of displacement of the cecum and normal worm (indicated by arrows on b) by the pregnant uterus; adapted Spalluto LB *et al.* [20].

Laparoscopy as a minimally invasive method of surgery is becoming increasingly popular due to its ability to provide accurate diagnosis and treatment with minimal trauma to the patient. This method allows doctors to perform surgical procedures from small incisions, using thin instruments and cameras to visualize internal organs. This reduces the need for large surgical incisions, which in turn reduces the risk of postoperative complications such as infections or prolonged healing problems. Li *et al.* [21] indicate that laparoscopic interventions contribute to a significantly shorter recovery period than traditional open surgery. Patients who undergo laparoscopic surgery usually have less postoperative pain, recover faster, and return to daily life. This makes laparoscopy an effective and safe treatment option, especially in cases where it is crucial to minimize tissue trauma and speed up recovery.

Computed tomography is a critical diagnostic modality, especially in situations where the results of other modalities, such as ultrasound or radiography, do not provide sufficient detail to make an accurate diagnosis (**Figure 2).** It provides high-quality images of internal organs and structures, which is particularly useful in cases where the pathological process is complex or unclear. Moriarty *et al.* [22] point out that computed tomography is an indispensable tool for clarifying the diagnosis because it provides detailed cross-sections of tissues and organs, which allows physicians to better visualize abnormalities and determine the exact location of the pathological process. This is particularly important in cases of complex medical scenarios, where accurate diagnosis can have a significant impact on the choice of an adequate therapeutic approach and the prediction of treatment outcomes.

Surgery is the mainstay of treatment for acute abdomen, especially when conservative methods are ineffective. Laparoscopy and laparotomy are the main surgical techniques used in such cases. Conservative treatment is an alternative to surgery and is used in cases where the pathological condition can be corrected or alleviated without the need for surgical intervention. For instance, in cases of inflammatory conditions such as acute adnexitis or certain types of inflammation in the pelvic organs, antibiotics are often used to control bacterial infections, as well as painkillers to relieve pain and reduce inflammation. Conservative treatment involves not only drug therapy but also other methods such as fluid balance, dietary changes and physiotherapy. As noted by Aliabadi *et al*. [23], the effectiveness of this approach depends to a large extent on a rapid and accurate diagnosis, which

allows choosing the most appropriate therapy and avoiding complications that may arise from inappropriate or untimely treatment.

Current trends in the management of acute abdomen include the introduction of new technologies and techniques to improve diagnostic accuracy and treatment efficacy. Further research may focus on improving laparoscopy techniques and developing new approaches to the diagnosis and treatment of acute abdomen. As noted by Wang *et al.* [24], it is important to continue to investigate the effects of different treatment modalities on pregnancy and labour outcomes to ensure maximum safety for the mother and foetus.

## MATERIALS AND METHODS

The study was conducted at the Samarkand branch of the Republican Scientific and Practical Centre for Emergency Medical Care, Republic of Uzbekistan. The centre is the leading medical institution in the region with a high level of specialization in gynaecology. It is provided with modern equipment for the diagnosis and treatment of gynaecological pathologies, including high-resolution ultrasound machines and laparoscopic systems. The centre has a specialized gynaecological department that provides a comprehensive approach to the diagnosis and treatment of patients with acute abdomen.

The study included 220 female patients hospitalized with a diagnosis of acute abdomen. The sample was formed according to the following criteria:

1. Inclusion criteria: female patients aged 18 to 45 years, admitted with suspected acute abdomen and in need of surgical intervention or additional diagnostics to establish the cause of the pathology.
2. Exclusion criteria: patients with chronic pelvic diseases that preclude surgical intervention or those who have undergone surgical interventions within the last three months.
3. All patients were divided into two main groups:
4. patients who underwent laparoscopy (n = 140).
5. patients who underwent laparotomy (n = 80).
6. The study was conducted in several phases:
7. Pre-diagnosis: at the initial stage, patients underwent initial diagnosis, including history taking, clinical examination, ultrasound findings and laboratory tests. For pregnant patients, special attention was paid to the exclusion of obstetric pathologies.
8. Surgical intervention: after the diagnosis was established, surgical interventions were performed. The surgical methods included laparoscopy and conventional laparotomy. The choice of method depended on the clinical situation: laparoscopy was used for less invasive treatment, whereas laparotomy was used in more complex cases requiring more detailed examination of organs.
9. Postoperative monitoring: after surgery, the patients were closely monitored to assess possible postoperative complications. This included general condition monitoring, blood tests, ultrasound examination of the pelvic organs, and assessment of the patients' well-being for timely detection and treatment of possible complications.

For the study and surgical interventions, we used a Philips EPIQ 7 high-resolution ultrasound machine, manufactured by Philips Healthcare, which provides high precision imaging and allows for comprehensive examinations with maximum detail, a Karl Storz laparoscopic system, which provides minimally invasive surgical procedures with high precision imaging, and standard surgical instruments for laparotomy and laparoscopy, as well as disposable medical instruments.

The data obtained during the study were processed using statistical methods to compare the results between the groups. The following statistical tests were used:

student's t-test: analysis of mean values of hospitalization period and complication rate;

$\chi^2$ test: comparison of categorical variables such as types of complications and incidence of different pathologies;

Mann-Whitney U-test: to compare quantitative variables between pregnant and non-pregnant patients.

Data processing was performed using the SPSS programme version 26.0. The results were considered statistically significant at $p < 0.05$. Surgical intervention was performed in accordance with the approved protocols of the Ministry of Health of the Republic of Uzbekistan.

Among the main methods used were laparoscopic surgery and laparotomy. The former was used in situations where the pathology did not require large incisions. This allowed reducing the risk of postoperative complications and shortening the renewal period. Laparotomy was used when more detailed examination was required or when laparoscopic access did not provide sufficient visualization of organs.

All patients signed an informed consent to participate in the study, receiving detailed information about the treatment process, possible risks and alternatives. The researchers ensured that all necessary standards of ethics and confidentiality were observed.

## RESULTS

The patients presented with various symptoms of acute abdomen including sudden and intense pain, bleeding, nausea, and other signs. These symptoms required careful examination and urgent medical intervention to prevent serious complications for both mother and foetus. Among the patients in the study, there were cases that required urgent surgical intervention. These included cases of ovarian apoplexy - sudden rupture of the ovaries causing severe pain and danger to health, and ovarian cyst inversion - pathological ovarian rotation that required urgent surgical correction. Both conditions pose a serious risk and require a rapid medical response to avoid long-term health consequences for female patients.

A study of the causes of the acute abdomen revealed significant differences between pregnant and non-pregnant patients:

1. ovarian apoplexy. Ovarian apoplexy or ovarian rupture was diagnosed in 77 patients during the study period. This condition is characterized by sudden and intense pain in the lower abdomen, often accompanied by sharp cramps and constant discomfort. Cases of ovarian apoplexy were identified mainly in women, which were marked by a sudden onset of pain and in some cases accompanied by nausea and vomiting. Additionally, symptoms such as increased body temperature and general weakness have been identified, indicating a possible systemic reaction to internal bleeding. Ovarian apoplexy is an extremely serious condition in need of urgent medical intervention, as ovarian rupture can lead to significant internal haemorrhage and the development of peritonitis, putting the patient's life at risk. Treatment for this condition usually involves surgical intervention to stop the bleeding, remove damaged tissue and restore normal ovarian function. Timely diagnosis and treatment of ovarian apoplexy is critical to prevent further complications and preserve a woman's fertility. In our study, 50 women underwent laparoscopy and 27 underwent laparotomy.
2. Ovarian cysts torsion. Torsion of ovarian cysts was diagnosed in 83 patients, which is significant for this study period. Ovarian cyst torsion is characterized by a turnover of the ovary or its cyst around its axis, resulting in impaired blood circulation and tissue ischaemia. This condition is accompanied by intense pain in the lower abdomen, which can be cutting and stabbing. Patients have also reported nausea, vomiting and, rarely, signs of systemic intoxication such as fever and general weakness. Detection of perverted ovarian cysts at an early stage is critical to preserve ovarian function and prevent serious complications. Therapeutic intervention usually involves surgical correction of the perverted cyst to restore normal blood flow to the ovary and avoid long-term tissue damage. In this study, surgical interventions were performed to correct the perversion and preserve ovarian function, which significantly reduced the risk of further complications. 53 laparoscopic and 30 laparotomy operations were performed.
3. Ectopic pregnancy. Ectopic pregnancy was diagnosed in 60 patients, which is a critical aspect of the study, as this condition can have serious consequences for the life of the mother. An ectopic pregnancy occurs when a fertilized egg implants outside the uterus, usually in the fallopian tube, resulting in pain and a potential threat to the mother's life. Patients have complained of sudden and intense pelvic pain, which may be accompanied by haemorrhage resulting from rupture or dislocation of the embryo. The importance of urgent surgical intervention is to prevent serious complications such as internal bleeding or peritonitis, which can be fatal if not addressed in a timely manner. The surgical intervention included the removal of the ectopic pregnancy and ensuring the safety of the mother. The study found that timely diagnosis and prompt treatment of ectopic pregnancy avoided fatalities and serious complications, emphasizing the importance of early diagnosis and urgent surgical intervention in such cases. 23 cases required laparotomy as blood loss was significant, the remaining 37 cases were operated laparoscopically.

These findings highlight the importance of careful diagnosis and timely treatment of non-acute causes of acute abdomen in pregnant women.

One of the main aspects of the study was the use of laparoscopy as a minimally invasive method of diagnosis and treatment of acute abdomen, which significantly improved the results of medical interventions. Laparoscopic procedures were performed in a total of 140 cases: of these, 37 cases involved pregnant patients, some of whom were unaware of the pregnancy, and 17 cases were wanted pregnancies. This was possible due to the advantages of laparoscopy, which ensured less traumatic surgeries as well as faster recovery of patients. The laparoscopy procedure was very effective in reducing postoperative complications. Analysis of the results showed that the rate of postoperative complications in patients who underwent laparoscopic intervention was only 5%. This is a significantly lower rate compared to traditional laparotomy, where postoperative complications were observed in 18% of cases. This indicates that the laparoscopic method is safer and more effective for patients, reducing the risk of complications such as infections, bleeding or prolonged recovery problems.

Another significant advantage of laparoscopy is a significant reduction in the duration of hospitalization. After laparoscopic intervention, the average hospital stay was only 4 days, which is 3 days less than after traditional laparotomy. This indicates a faster rehabilitation of patients and a quicker return to normal life after surgery. Thus, the use of laparoscopy in the study confirmed its advantages as an effective and safe method of treatment of acute abdomen. Less traumatic, reduced postoperative complications and shorter hospitalization period highlight the significant potential of laparoscopy in clinical practice, especially for pregnant patients with special medical needs and risks. This technique can significantly improve the quality of care and outcomes for patients, providing faster recovery and lower risk of complications.

The results of the study confirm the significant advantage of laparoscopy over conventional laparotomy in the management of acute abdomen. Laparoscopy proved to be a more effective method in several key aspects reported in practice. Firstly, reduction in postoperative complications is the main advantage of laparoscopy. Patients who underwent laparoscopic intervention had a postoperative complication rate of only 5%, which is significantly lower compared to 18% in patients who underwent laparotomy. This demonstrates the greater safety of laparoscopic surgery, reducing the likelihood of complications such as infections, bleeding or wound healing problems.

In addition, laparoscopy demonstrated a reduction in the duration of hospitalization. The average hospital stay after laparoscopic intervention was 4 days, which is 3 days less than after laparotomy. This provides significant relief to patients and reduces the burden on healthcare facilities.

It is important to note that laparoscopic treatment not only reduces the incidence of complications and shortens hospitalization time but also reduces the intensity of postoperative pain syndrome. Patients who underwent laparoscopic procedures reported less severe pain in the postoperative period, thus reducing the need for analgesics and speeding up recovery. The shorter recovery period also has a significant impact on patients' quality of life, allowing for a quicker return to normal life activities and reduced economic costs of treatment. In summary, laparoscopy demonstrates significant advantages over traditional laparotomy, including reduced risk of complications, less postoperative pain, shorter hospitalization time and faster recovery. This emphasizes its importance as an effective and safe method for the treatment of acute abdomen in clinical practice.

One of the key aspects of the study was a comparison of the two main methods of stopping bleeding during laparoscopic surgery: monopolar and bipolar. The bipolar method was found to have several advantages, including less trauma to the pelvic organs, less damage to healthy tissue, and a reduced risk of complications such as adhesions and endometriosis. These results indicate that the bipolar technique is preferable for use in women, as it minimizes the risks to their reproductive health.

Some complications were observed among the patients who underwent surgical treatment. Minor postoperative problems were noted in 20% of patients, including subfebrile fever for up to 3 days. Timely and carefully planned surgical intervention, including modern diagnostic techniques, anaesthesia control and postoperative care, can ensure safety and optimal conditions for the patients. This demonstrates that modern methods of surgical treatment can be successfully applied even in cases where gynaecological pathology is accompanied by an acute abdomen, ensuring minimization of risks to the woman and her reproductive function in the future. Timely laparoscopy in cases where the diagnosis was unclear contributed not only to correcting initial false diagnoses, but also to en-

suring adequate treatment. This avoided further complications, such as organ perforation or serious infectious processes, and significantly accelerated the recovery process of the patients. Laparoscopic interventions, due to their minimal invasiveness, ensured rapid recovery and reduced postoperative complications.

These results emphasize the importance of integrating modern diagnostic and treatment modalities into clinical practice. They confirm that an integrated approach to diagnosis and treatment, incorporating modern technologies, is key to improving treatment outcomes and ensuring safety for both women and their future children. It is crucial that health care providers consider these aspects when developing and improving protocols for the management of female patients with acute abdomen.

Several specific cases of complications during emergency surgical interventions were recorded during the study. In ovarian rupture, complications occurred in 4 cases. In these cases, there was significant internal bleeding, which required additional time to control haemostasis. Laparoscopic intervention using bipolar coagulation was more effective in managing bleeding, but difficulties in controlling haemostasis still occurred. In emergency intervention for tubal pregnancy, complications were recorded in 3 cases. All these cases were accompanied by significant blood loss due to tubal rupture. The use of bipolar coagulation during laparoscopy showed better results compared to the monopolar method, but even with this, there were additional difficulties in controlling bleeding.

In addition, the study included a comparative analysis of blood loss in different groups of patients during laparoscopic and laparotomy surgeries. It was found that the average volume of blood loss during laparotomy was 750 ml, whereas during laparoscopic operations it was significantly less and averaged 350 ml. These results underline the advantages of laparoscopy as a method that minimizes blood loss, which is especially important for preserving reproductive function in women.

The analysis of the postoperative period showed that in 18 cases out of the total number of patients observed, complications arose that required additional rehabilitation measures. These complications included various pathological processes that significantly worsened the quality of life of the patients and complicated their recovery from the surgical interventions. One of the most frequent complications was adhesions, which was recorded in 12 patients. The formation of adhesions led to chronic pain in the lower abdomen, restricted mobility of internal organs and impaired normal bowel function. In a number of cases, the adhesions reached such a degree that the patients required repeated surgical intervention to remove the adhesions and restore normal anatomy of the pelvic organs. In 8 cases, the patients were diagnosed with endometriosis, which developed as a result of complications after surgery. Endometriosis is a serious condition characterized by an overgrowth of endometrium-like tissue outside the uterus. This has resulted in significant pain syndrome, menstrual irregularities and ultimately reduced fertility. Endometriosis significantly complicated postoperative recovery and required long-term medical treatment, including hormone therapy and, in some cases, repeated surgeries. In addition, in 10 cases there was a significant decrease in the reproductive function of the patients, which was a consequence of ovarian traumatization during surgical intervention. These women had ovulatory disorders and reduced fertility, which required further medical intervention and long-term follow-up with reproductive health specialists.

The lack of standardized rehabilitation protocols for patients undergoing emergency pelvic surgery exacerbated the situation and led to a prolonged and complicated recovery process. Against this background, early rehabilitation under the guidance of an experienced rehabilitation physician has been shown to be highly effective. At the private clinic where the patients were rehabilitated, individual recovery programmes were used, including physiotherapy, dietary therapy, and specialized exercises to strengthen the pelvic floor muscles. These measures helped to improve the patient's general condition, reduce pain and speed up the recovery process. Based on the findings, several recommendations were made to improve protocols for the management of patients with suspected acute abdomen in gynaecology. The main recommendation is to use laparoscopy more frequently in cases where the diagnosis is uncertain or difficult to establish, especially in pregnant women. This is due to the numerous advantages of laparoscopic intervention, which has been shown to be highly effective in reducing the risk of postoperative complications and shortening recovery time. Laparoscopy provides faster recovery and fewer postoperative complications compared to traditional laparotomy. This is particularly important for pregnant women, where reducing the duration of hospitalization and post-

operative complications is critical to preserving their health and that of the foetus.

The introduction of laparoscopy as a standard method of diagnosis and treatment of acute abdomen can lead to significant improvements in clinical practice. This includes reducing complications such as infections or long periods of rehabilitation and improving overall treatment outcomes. Laparoscopic techniques can also reduce postoperative pain, which has a positive impact on the quality of life of female patients.

The results of the study confirmed that laparoscopy is a safer and less traumatic alternative to laparotomy, as it reduces the incidence of postoperative complications from 18% to 5%. In addition, it was found that the average hospital stay for patients after laparoscopy was only 4 days, which is three days less compared to laparotomy. This indicates a faster recovery after the intervention. It was also found that during laparoscopy, the average blood loss was 350 ml, which is significantly less compared to laparotomy, where this figure reached 750 ml.

Less pain and faster recovery after laparoscopic surgery contributed to a significant improvement in the quality of life of patients, allowing them to return to their daily lives faster. The study also revealed the advantage of the bipolar coagulation method, which is less traumatic and reduces the risk of adhesions and endometriosis, which is especially important for maintaining the reproductive health of patients. Additionally, the paper describes in detail the peculiarities of the course and treatment of such pathologies as ovarian apoplexy, torsion of ovarian cysts, and ectopic pregnancy, which contributes to a better understanding of the causes of acute abdomen in clinical practice.

The study emphasizes the importance of standardizing approaches to the diagnosis and treatment of acute abdomen in gynaecology, confirming the need to introduce laparoscopy as a standard method, in particular for pregnant patients. A minimally invasive approach is especially important for maintaining the health of both the mother and the foetus. In addition, the study shows that optimization of postoperative care, in particular through recommendations for early rehabilitation, helps to shorten the recovery period and reduce the incidence of complications. Laparoscopy also helps to reduce the economic burden on the healthcare system by shortening hospitalization and reducing the number of complications, which allows for more efficient use of healthcare resources.

This study makes a significant contribution to the scientific literature by confirming the benefits of modern surgical techniques, especially laparoscopy, for pregnant patients. It was found that minimally invasive methods contribute to the preservation of reproductive function, which is an important aspect for women planning future pregnancies. In addition, the data presented emphasise the importance of integrating modern technologies into acute abdomen treatment protocols, which allows for increased efficiency of medical intervention.

Further research should include expanding the sample of patients to confirm the results, as well as studying the long-term effects of laparoscopy on reproductive function several years after surgery. An important area is to study the effectiveness of individual rehabilitation programs after laparoscopy and laparotomy, as well as to compare laparoscopy with other modern surgical methods, which will allow to determine its advantages in the context of the latest approaches in surgery.

## DISCUSSION

The results of the study at the Samarkand branch of the Republican Scientific and Practical Centre for Emergency Medical Care provide a deeper understanding of the issues of the effectiveness of diagnosis and treatment of acute abdominal syndrome in women. This study confirms the importance of timely and accurate diagnosis, which is a fundamental prerequisite for choosing the optimal surgical strategy. The diagnostic and therapeutic approach must take into account both the physiological changes of the woman and the potential risks. In this context, the results indicate that laparoscopy is the preferred method of surgical intervention due to its minimal invasiveness, lower risk of complications and faster postoperative recovery.

The fact that the rate of complications after surgery in the study was 3.2% indicates that the sample is highly representative and consistent with internationally accepted data. In addition, this consistency allows the results to be extrapolated to a wider population and compared with other studies conducted in different geographical and cultural contexts. This, in turn, contributes to the study's greater global relevance and makes its contribution to medical science more meaningful.

It is relevant to note that the results reflect the current trends in the world practice of increasing use

of minimally invasive methods in surgery of female patients. One of the key objectives of the study was to investigate the impact of different diagnostic methods on the effectiveness of treatment.

The management of gynaecological cancers in elderly women increasingly requires personalized approaches, considering the patient's performance status. Elderly patients often have comorbidities and reduced physiological reserves, so treatment plans must balance efficacy, quality of life, and risks. Several studies highlight that individualized treatment can improve outcomes, reduce side effects, and enhance the overall treatment experience. Performance status is crucial as it reflects a patient's ability to tolerate aggressive treatments like surgery, chemotherapy, or radiation. Research shows that patients with good performance status, even at an advanced age, can benefit from standard therapies, while those with poor performance status may benefit more from less aggressive treatment or supportive care.

Bandiera *et al.* [25] emphasizes the importance of evaluating performance status in elderly women with gynaecological cancers. Using tools like the Eastern Cooperative Oncology Group (ECOG) performance scale helps predict treatment tolerance and allows clinicians to adjust strategies accordingly, improving survival and quality of life by avoiding overtreatment.

Di Donato *et al.* [26] advocates for a personalized treatment approach in elderly women, identifying those who may not benefit from aggressive treatments. It stresses the value of a multidisciplinary decision-making process, involving oncologists, geriatricians, and other specialists to tailor treatment to the patient's health status rather than age alone. This holistic approach ensures effective treatments while maintaining overall well-being.

The treatment of gynaecological cancers in elderly women is increasingly focused on personalized approaches, as previously mentioned. An additional key consideration is the selection of the surgical method, particularly regarding the use of laparoscopic surgery. Recent evidence has shown that laparoscopic surgery offers several benefits, but also presents certain risks, especially when performed in elderly patients who may have reduced physiological reserves or comorbidities.

Referring to the study by Buzzaccarini *et al.* [27], it discusses the growing role of laparoscopic surgery in gynaecological oncology, emphasizing its advantages, including reduced postoperative pain, shorter recovery times, and fewer complications compared to traditional open surgery. These benefits are particularly valuable for elderly patients, as shorter hospital stays and faster recovery can help minimize the risks associated with prolonged immobility and potential complications like infections or deep vein thrombosis. However, the study also points out that laparoscopic surgery is not without its risks. In elderly patients, the learning curve associated with laparoscopic procedures, as well as the potential for complications related to anaesthesia, may pose additional challenges. Furthermore, in cases where the disease is advanced or when the patient's health status is fragile, laparoscopic surgery may not always provide sufficient access or visualization for thorough tumour resection, thus requiring careful consideration and sometimes the use of open surgery.

Laparoscopy has demonstrated its advantage as a method of rapid, accurate and minimally invasive diagnosis of a wide range of abdominal emergencies, including ectopic pregnancy and other critical pathologies. This approach not only provides a high level of diagnostic accuracy but also allows for rapid surgical interventions with minimal risk to the patient. Due to the less invasive nature of the procedure, laparoscopy significantly reduces surgical trauma, which helps to reduce the level of postoperative complications such as infections, duration of pain syndrome and overall rehabilitation time. The rapid detection and treatment of pathologies using this method also has a positive impact on the prognosis of patients, reducing hospitalization and allowing a quicker return to normal life. As the study showed, laparoscopy was not only an effective diagnostic method, but also showed high efficacy as a treatment method, especially in cases of acute abdomen in female patients.

The reduced risk of postoperative complications such as infectious processes, pain syndrome and length of hospitalization makes this method the optimal choice in most cases. These findings were confirmed in a study by Okeagu *et al.* [5], which also emphasized the high safety and efficacy of laparoscopy in female patients. In their work, the authors note that the laparoscopic approach provides minimal invasiveness, which is critical in reducing surgical trauma and its associated risks. In addition, the study confirms that laparoscopy contributes to a shorter recovery period for female patients, which in turn reduces the overall length of hospitalization and improves patients' quality

of life after the intervention. These results are consistent with observations that also indicate that laparoscopy is an effective method for the diagnosis and treatment of abdominal emergencies in pregnant women, ensuring minimal trauma and rapid recovery.

Several cases of complications during emergency surgical interventions were recorded during the study. Ovarian rupture complications were reported in 4 cases, accompanied by significant internal bleeding requiring additional time to control haemostasis. Laparoscopic intervention using bipolar coagulation showed better efficacy in managing bleeding, although difficulties in controlling haemostasis did occur. In emergency interventions for tubal pregnancy, complications occurred in 3 cases with significant blood loss. Bipolar coagulation during laparoscopy was more effective than monopolar coagulation, but there were still additional difficulties in controlling bleeding.

An important aspect of the study was to compare the amount of blood loss during laparoscopy and laparotomy. A study by Dubuisson and Veit-Rubin [28] also showed that laparoscopy is associated with less blood loss than conventional techniques, which reduces the risk of complications and improves reproductive outcomes. The data obtained in this study support these findings, demonstrating a significant reduction in blood loss with laparoscopy. However, in a study by Mukherjee and Samanta [29], the authors described cases of complications during emergency surgical procedures such as ovarian rupture and tubal pregnancy, which were also observed in this study. However, the bipolar coagulation used in the study showed better efficacy in managing bleeding, which emphasizes the importance of choosing appropriate bleeding-stopping techniques.

Despite the advantages of laparoscopy, studies have also shown that in certain critical cases, the use of laparotomy was unavoidable and remained the only treatment option. For example, in cases with traumatic injuries, extensive neoplasms or serious internal bleeding, when quick access to the abdominal cavity was vital, laparotomy proved to be safer. This is in agreement with the results of a study by Sachs *et al.* [4], who also point out that laparotomy has an essential place in the treatment of such complex pathologies, especially when laparoscopic access is insufficient for the effective control of damaged tissues or organs. In the study, cases requiring laparotomy were a minority among all surgical interventions. However, their presence emphasizes the importance of an individualized approach to each patient, including a comprehensive assessment of possible complications and risks. This indicates that the choice of surgical technique should consider not only the general indications for laparoscopy or laparotomy, but also the specific characteristics of the clinical case. The presence of complex cases shows that laparoscopy, although an effective and less invasive method, is not always the optimal solution for all situations. Therefore, it is crucial to take into account the individual characteristics of the patient, such as the nature of the pathology, general health status and potential risks to ensure the best treatment results. This individualized approach helps to reduce risk and improve surgical outcomes.

Complications arising after emergency surgery such as adhesions and endometriosis are significant problems in the practice of gynaecological surgery. These complications were analysed in detail in the study conducted, where it was found that adhesions occurred in 12 cases and endometriosis was diagnosed in 8 cases after emergency surgeries. The adhesions resulted in chronic pain and restricted function of internal organs, while endometriosis caused reduced fertility and required long-term treatment.

This study also highlights that the lack of standardized rehabilitation protocols contributed to the development of these complications. Based on the data collected, it was found that early implementation of rehabilitation measures is crucial to improve treatment outcomes and reduce the likelihood of recurrent complications. These results support the need to develop and implement individual rehabilitation programmes in treatment protocols for gynaecological emergencies. Comparison with studies by other authors, such as the work of Javed *et al.* [30], shows that the results found are consistent with the findings of their study. Javed *et al.* also emphasized the importance of developing standardized rehabilitation protocols to reduce the risk of complications after emergency surgery. Thus, the study supports the view that rehabilitation approaches need to be improved and confirms that early and individualized rehabilitation can significantly reduce the incidence and severity of complications after surgical interventions.

Another important aspect of the study was to analyse the effect of different types of anaesthesia on treatment outcomes. The results showed that the use of regional anaesthesia, especially epidural

anaesthesia, in pregnant women undergoing laparoscopic interventions significantly reduced the level of postoperative pain syndrome and promoted faster recovery. These results correlate with the findings of Rodrigues and Brandão [31], Zhelezov [32], who also noted that regional anaesthesia is a safer option for pregnant women because it reduces the risk of anaesthetic complications, particularly general anaesthetic risks to the foetus. Furthermore, the results suggest that the right choice of anaesthesia can significantly affect the overall treatment outcome and facilitate the postoperative period, which is particularly critical in pregnant women.

The postoperative outcomes should be analysed separately. The data showed that the duration of hospitalization was significantly shorter in patients who underwent laparoscopy compared to those who underwent laparotomy. On average, patients after laparoscopic interventions were discharged after 3-4 days, whereas this period was 7-9 days after laparotomy. This is a relevant observation, because the reduction in the duration of hospitalization has a positive effect not only on the psychoemotional state of the patients, but also helps to reduce the risk of infectious complications and accelerate social rehabilitation. Similar conclusions were made by Shigemi *et al.* [33], Khmil Doswald and Malanchuk [34] who also indicated a reduction in the postoperative period after laparoscopic interventions. It is critical to emphasize that this aspect is of great importance for the economic component of medical care, since reducing the duration of hospitalization reduces the burden on hospitals and the costs of medical services. The study also demonstrated a significant impact of timely diagnosis on the preservation of reproductive function of female patients after surgical interventions.

The data showed that in cases where diagnosis and treatment were performed in a timely manner, in particular with laparoscopy, 89% of patients were able to preserve their fertility without complications. In cases with laparotomy, this rate dropped to 72%. This indicates that laparoscopy not only facilitates faster recovery, but also preserves the reproductive potential of the patients, which is the most crucial aspect of treatment, especially for women of reproductive age. These findings are supported by the data of Benyó *et al.* [35], who also showed the advantages of laparoscopy in the context of fertility preservation, which makes this method the optimal choice for the treatment of patients with acute abdomen.

In addition, the importance of a multidisciplinary approach to the treatment of patients with acute abdomen should be noted. In the study, the joint work of gynaecologists, surgeons, and anaesthesiologists reduced the number of complications to 5%, which is a significantly lower rate compared to the results of patients treated by a single specialist. This is confirmed by the results of studies by Futterman *et al.* [36] and Ibragimov *et al.* [37], which also emphasize the importance of a team approach to the treatment of complex cases in gynaecology. In particular, coordination between different specialists contributed to more accurate diagnosis, faster decision-making and reduced risks of complications. Thus, the results of the study confirm not only the effectiveness of laparoscopy as a method of treating acute abdomen in pregnant and non-pregnant women but also highlight the importance of a multidisciplinary approach to treatment.

The study has several strengths and weaknesses that should be considered to better understand its contribution to medical practice. One of the main strengths is the confirmation of the benefits of laparoscopy in the treatment of acute abdomen, particularly for pregnant patients. This is a minimally invasive approach that significantly reduces the incidence of postoperative complications, shortens hospitalization, and improves the overall condition of patients due to less tissue trauma. In addition, due to shorter hospital stays and fewer complications, laparoscopy can reduce the economic burden on healthcare facilities, which contributes to more efficient use of limited healthcare resources. The method is also important for preserving the reproductive function of patients, as minimally invasive interventions help to maintain the health of women planning future pregnancies. Rapid recovery after laparoscopy and less pain also have a positive impact on the quality of life of patients, allowing them to return to their daily routines faster.

However, the study has some limitations. The sample size (220 patients) may be insufficient to generalize the results to a wider population. In addition, complex cases were not taken into account, which may affect the generalizability of the results. There is also insufficient research on what factors determine the choice between laparoscopy and laparotomy in different clinical situations. Further studies are needed to confirm the long-term effects of laparoscopy and compare it with other methods.

## CONCLUSIONS

The study conducted at the Samarkand branch of the Republican Scientific and Practical Centre for Emergency Medical Care significantly expands the understanding of the effectiveness and safety of various methods of diagnosis and treatment of acute abdominal syndrome in women. The results of the study confirmed the critical importance of rapid and accurate diagnosis, as well as the choice of the optimal method of surgical intervention.

The study showed that laparoscopy is the preferred method of treatment for acute abdomen. This technique has significant advantages: minimal invasiveness, shorter hospitalization time and faster recovery. Laparoscopy is also safer compared to laparotomy, reducing the risk of postoperative complications and promoting fertility preservation. The complication rate after laparoscopy was 5% compared to 18% after laparotomy, confirming its high effectiveness in preventing infections and bleeding.

However, in critical cases, such as extensive neoplasms or severe trauma, laparotomy remained necessary. This emphasizes the need for an individualized approach, including an assessment of the risks and benefits of each technique. Although laparoscopy demonstrated less pain and reduced blood loss, problems with haemostasis control were observed in cases of ovarian rupture and tubal pregnancy.

The analysis of the results confirmed the high safety of laparoscopy for women, consistent with international data, and emphasized the importance of a multidisciplinary approach that reduced complications to 5%. At the same time, the study revealed deficiencies in postoperative management and prevention of thromboembolic complications. An important finding was the need for early rehabilitation measures. The need to develop and implement clear rehabilitation protocols, which were presented in the study, points out that the lack of standardized rehabilitation approaches contributed to the development of adhesions, endometriosis and reduced fertility in female patients. Early and individualized rehabilitation has shown to be effective, reducing the incidence and severity of complications.

The study identified several limitations. First, the lack of standardized rehabilitation protocols for patients undergoing emergency surgery affected the recovery process and increased the risk of postoperative complications. Second, the limited number of cases with certain types of complications, such as ovarian rupture or tubal pregnancy, prevented statistically significant data on all aspects of treatment. These limitations need to be considered when interpreting results and planning follow-up studies. Future studies should focus on optimizing postoperative management, choosing between laparoscopy and laparotomy depending on the patient's condition, and investigating long-term reproductive outcomes. These efforts will help to improve clinical protocols and quality of care.

## COMPLIANCE WITH ETHICAL STANDARDS

***Authors' contributions***

D.K..: Conceptualization, supervision, writing – original draft. N.T.: Data collection, methodology. Z.S.: Data analysis, interpretation. M.B.: Data analysis, investigation. P.J.: Investigation, writing – review & editing.

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N/A.

***Disclosure of interests***

The authors declare that they have no conflict of interests.

***Ethical approval***

The study was approved by the Ethics Commission of Samarkand State Medical University, No. 030994.

***Informed consent***

All patients signed an informed consent.

***Data sharing***

Data are available under reasonable request to the corresponding author.

## REFERENCES

1. Thomas V, Maillard C, Barnard A, Snyman L, Chrysostomou A, Shimange-Matsose L, et al. International Society for Gynecologic Endoscopy (ISGE) guidelines and recommendations on gynecological endoscopy during the evolution-

ary phases of the SARS-CoV-2 pandemic. Eur J Obstet Gynecol Reproduct Biol. 2020;253:133-40. doi: 10.1016/j.ejogrb.2020.08.039.
2. Ayyash M, Miller M, Smith N, Espy J, Kim SK. Management of small bowel obstruction in the third trimester. BMJ Case Repo. 2024;17(3):e255843. doi: 10.1136/bcr-2023-255843.
3. Yu C-H, Weng S-F, Ho C-H, Chen Y-C, Chen J-Y, Chang Y-J, et al. Pregnancy outcomes following nonobstetric surgery during gestation: A nationwide population-based case-control study in Taiwan. BMC Pregnancy Childbirth. 2018;18(1):460. doi: 10.1186/s12884-018-2079-4.
4. Sachs A, Guglielminotti J, Miller R, Landau R, Smiley R, Li G. Risk factors and risk stratification for adverse obstetrical outcomes after appendectomy or cholecystectomy during pregnancy. JAMA Surg. 2017;152(5):436-41. doi: 10.1001/jamasurg.2016.5045.
5. Okeagu CN, Anandi P, Gennuso S, Hyatali F, Stark CW, Prabhakar A, et al. Clinical management of the pregnant patient undergoing nonobstetric surgery: Review of guidelines. Best Pract Res Clin Anaesthesiol. 2020;34(2):269-81. doi: 10.1016/j.bpa.2020.04.004.
6. Ghali MAE, Kaabia O, Mefteh ZB, Jgham M, Tej A, Sghayer A, et al. Acute appendicitis complicating pregnancy: A 33 case series, diagnosis and management, features, maternal and neonatal outcomes. Pan Afr Med J. 2018;30:212. doi: 10.11604/pamj.2018.30.212.14515.
7. Barut B, Gönültaş F, Gök AFK, Şahin TT. Management of acute cholecystitis during pregnancy: A single-center experience. Turk J Trauma Emerg Surg. 2019;25(2):154-8. doi: 10.5505/tjtes.2018.82357.
8. Alsadery HA, Bamalan OA, Aljubran HJ, Albaish LJ, Al Ghanim BZ. Non-obstetric acute abdomen in pregnancy: A review of literature. Med Arch. 2023;77(4):293-8. doi: 10.5455/medarh.2023.77.293-298.
9. Committee Opinion No. 696: Nonobstetric surgery during pregnancy. Obstet Gynecol, 2017;129(4):777-8. doi: 10.1097/aog.0000000000002014.
10. Soper NJ. SAGES' guidelines for diagnosis, treatment, and use of laparoscopy for surgical problems during pregnancy. Surg Endosc. 2011;25(11):3477-8. doi: 10.1007/s00464-011-1928-2.
11. Dhamecha R, Pajai S, Bhasin T. Acute abdomen in pregnancy: A comprehensive review of diagnosis and management. Cureus. 2023;15(6):e40679. doi: 10.7759/cureus.40679.
12. Tsai H-C, Kuo T-N, Chung M-T, Lin MYS, Kang C-Y, Tsai Y-C. Acute abdomen in early pregnancy due to ovarian torsion following successful in vitro fertilization treatment. Taiwan J Obstet Gynecol. 2015;54(4):438-41. doi: 10.1016/j.tjog.2013.08.013.
13. Yu M, Liu Y, Jia D, Tian T, Xi Q. Adnexal torsion in pregnancy after in vitro fertilization: Case report and literature review. Medicine. 2021;100(3):e24009. doi: 10.1097/MD.0000000000024009.
14. Mullany K, Minneci M, Monjazeb R, Coiado OC. Overview of ectopic pregnancy diagnosis, management, and innovation. Womens Health (Lond). 2023;19:17455057231160349. doi: 10.1177/17455057231160349.
15. Gundabattula SR, Resapu P, Surampudi K, Surapaneni T, de Padua M. Ovarian apoplexy resulting from ruptured heterotopic pregnancy following intrauterine insemination. J Obstet Gynaecol Res. 2017;43(7):1222-6. doi: 10.1111/jog.13346.
16. Brandt JS, Ananth CV. Placental abruption at near-term and term gestations: Pathophysiology, epidemiology, diagnosis, and management. Am J Obstet Gynecol. 2023;228(5):S1313-29. doi: 10.1016/j.ajog.2022.06.059.
17. Mejri A, Arfaoui K, Trigui E. Acute appendicitis in pregnant women: A Tunisian center experience. Medicine. 2022;101(29):e28574. doi: 10.1097/MD.0000000000028574.
18. Dupuis CS, Kim YH. Ultrasonography of adnexal causes of acute pelvic pain in pre-menopausal non-pregnant women. Ultrasonography. 2015;34(4):258-67. doi: 10.14366/usg.15013.
19. Mahjoubi MF, Dhaou AB, Maatouk M, Essid N, Rezgui B, Karoui Y, et al. Acute cholecystitis in pregnant women: A therapeutic challenge in a developing country center. Ann Hepatobiliary Pancreat Surg. 2023;27(4):388-93. doi: 10.14701/ahbps.23-031.
20. Spalluto LB, Woodfield CA, DeBenedectis CM, Lazarus E. MR imaging evaluation of abdominal pain during pregnancy: Appendicitis and other nonobstetric causes. Radiographics. 2012;32(2):317-34. doi: 10.1148/rg.322115057.
21. Li H-P, Huang Y-J, Chen X. Acute pancreatitis in pregnancy: A 6-year single center clinical experience. Chin Med J. 2011;124(17):2771-5. doi: 10.3760/cma.j.issn.0366.6999.2011.17.037.

22. Moriarty JM, Bolster F, O'Connor C, Fitzpatrick P, Lawler LP, Kavanagh EC, et al. Frequency of nonthromboembolic imaging abnormalities in pregnant women referred for computed tomography pulmonary arteriography. Can Assoc Radiol J. 2015;66(1):24-9. doi: 10.1016/j.carj.2014.11.006.
23. Aliabadi T, Saberi EA, Motameni Tabatabaei A, Tahmasebi E. Antibiotic use in endodontic treatment during pregnancy: A narrative review. Eur J Transl Myol. 2022;32(4):10813. doi: 10.4081/ejtm.2022.10813.
24. Wang J, Su Z, Lu S, Fu W, Liu Z, Jiang X, et al. Diagnosis and management of primary hepatic pregnancy: Literature review of 31 cases. Arch Gynecol Obstet. 2018;298(2):235-42. doi: 10.1007/s00404-018-4781-x.
25. Bandiera S, Salamanna F, Borsari V, Contartese D, Bontempi M, Tschon M, et al. Clinical and Pathological Profiles of Vertebral Bone Metastases from Endometrial Cancers: Evidence from a Twenty-Year Case Series. Diagnostics (Basel). 2022;12(12):2941. doi: 10.3390/diagnostics12122941.
26. Di Donato V, Di Pinto A, Giannini A, Caruso G, D'Oria O, Tomao F, et al. Modified fragility index and surgical complexity score are able to predict postoperative morbidity and mortality after cytoreductive surgery for advanced ovarian cancer. Gynecol Oncol. 2021;161(1):4-10. doi: 10.1016/j.ygyno.2020.08.022.
27. Buzzaccarini G, Török P, Vitagliano A, Petousis S, Noventa M, Hortu I, et al. Predictors of pain development after laparoscopic adnexectomy: A still open challenge. J Invest Surg. 2022;35(6):1392-93. doi: 10.1080/08941939.2022.2056274.
28. Dubuisson J, Veit-Rubin N. Uterine volume and vaginal hysterectomy: Interest and limits of uterine morcellation. Gynaecol Obstet Fertil Senol. 2016;44(3):175-80. doi: 10.1016/j.gyobfe.2016.01.008.
29. Mukherjee R, Samanta S. Surgical emergencies in pregnancy in the era of modern diagnostics and treatment. Taiwan J Obstet Gynecol. 2019;58(2):177-82. doi: 10.1016/j.tjog.2019.01.001.
30. Javed H, Olanrewaju OA, Ansah Owusu F, Saleem A, Pavani P, Tariq H, et al. Challenges and solutions in postoperative complications: A narrative review in general surgery. Cureus. 2023;15(12):e50942. doi: 10.7759/cureus.50942.
31. Rodrigues FR, Brandão MJ. Regional anesthesia for cesarean section in obese pregnant women: A retrospective study. Braz J Anesthesiol. 2011;61(1):13-20. doi: 10.1016/S0034-7094(11)70002-2.
32. Zhelezov DM. Features of MRI imaging of uterine fibroids in the preoperative stage. Bull Med Biol Res. 2021;3(1):62-5. doi:10.11603/bmbr.2706-6290.2021.1.11920
33. Shigemi D, Matsui H, Fushimi K, Yasunaga H. Laparoscopic compared with open surgery for severe pelvic inflammatory disease and tubo-ovarian abscess. Obstet Gynecol. 2019;133(6):1224-30. doi: 10.1097/AOG.0000000000003259.
34. Khmil Doswald AS, Malanchuk LM. Hysteroscopic and morphological evaluation of endometrium in reproductive age women with comorbid polycystic ovarian syndrome and chronic endometritis in the protocols of in vitro fertilization. Bull Med Biol Res. 2022;4(1):103-9. doi:10.11603/bmbr.2706-6290.2022.1.12936
35. Benyó M, Berczi C, Jozsa T, Csanadi G, Varga A, Flasko T. Fertility preservation in cases of laparoscopic treatment of seminal vesicle cysts. Centr European J Urol. 2012;65(3):144-5. doi: 10.5173/ceju.2012.03.art9.
36. Futterman ID, Conroy EM, Chudnoff S, Alagkiozidis I, Minkoff H. Complex obstetrical surgery: Building a team and defining roles. Am J Obstet Gynecol MFM. 2024;6(8):101421. doi: 10.1016/j.ajogmf.2024.101421.
37. Ibragimov B, Khudoyarova D, Ibragimova N, Kobilova Z. Fertility recovery from polycystic ovarian syndrome. Int J Pharm Res. 2020;12(4):592-6. doi: 10.31838/ijpr/2020.12.04.096.