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Research on the Causes and Preventive Measures of Pregnancy Complicated by Acute Abdomen

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Abstract

Acute abdomen refers to a sudden onset of severe abdominal pain that may require urgent surgical intervention, while biliary system diseases encompass disorders affecting the gallbladder, bile ducts, and associated structures. Acute abdomen during pregnancy represents one of the most challenging critical conditions in obstetrics, with its morbidity and mortality rates consistently ranking among the leading causes of maternal death. In recent years, with population aging and an increasing proportion of advanced-age pregnancies, the incidence of pregnancy-associated acute abdomen has shown an upward trend. This study systematically analyzes the primary etiologies, clinical characteristics, and therapeutic strategies of acute abdomen during pregnancy while exploring the effectiveness of preventive measures. Research indicates that pregnancy-specific anatomical and physiological changes, environmental factors, and genetic background play crucial roles in disease occurrence. The establishment of a comprehensive prevention system, including pre-pregnancy assessment, gestational monitoring, and emergency response planning, can significantly reduce incidence rates. Multi-center clinical data analysis demonstrates that early identification of risk factors, standardized prenatal examinations, and establishment of rapid diagnosis and treatment channels are key to improving successful treatment rates. This study provides new insights and methodologies for reducing the incidence and mortality rates of pregnancy-associated acute abdomen, holding significant implications for improving maternal and fetal outcomes.

Keywords

Pregnancy-Associated Acute Abdomen, Etiology, Prevention System, Clinical Diagnosis and Treatment, Prognosis Evaluation

1. Introduction

Pregnancy-associated acute abdomen, as a major challenge in obstetrics, has consistently been a focus of medical attention. This condition not only threatens maternal life and health but may also lead to fetal developmental abnormalities or death, with its clinical management characterized by unique complexities. Recent epidemiological studies indicate that the incidence of acute abdomen during pregnancy ranges from 0.2% to 2%, with acute appendicitis having the highest occurrence rate, accounting for 25% - 30% of pregnancy-related acute abdomen cases [1]. The series of physiological and anatomical changes during pregnancy present significant challenges for diagnosis and treatment, such as altered abdominal organ positions due to uterine enlargement, hormonal changes affecting digestive system function, and immune system modifications influencing inflammatory response manifestations. Differences in development levels among countries significantly impact maternal and fetal outcomes. In developing countries, limited access to advanced diagnostic tools and specialized medical care can lead to delayed diagnosis and treatment, resulting in higher morbidity and mortality rates. Conversely, in developed regions with advanced healthcare infrastructure, the availability of prompt diagnostic services and comprehensive preventive measures contributes to improved maternal and fetal outcomes. Socioeconomic factors, healthcare policies, and cultural practices further exacerbate these disparities, highlighting the need for tailored prevention and treatment strategies based on regional development levels. The latest statistics from the International Federation of Gynecology and Obstetrics show that mortality rates from pregnancy-associated acute abdomen remain high in developing countries, while outcomes have significantly improved in regions with advanced medical conditions due to progress in diagnostic techniques and improved prevention systems [2]. Domestic and international scholars have conducted extensive research on pregnancy-associated acute abdomen, achieving significant progress in etiology, diagnostic methods, and treatment strategies. Modern medical research indicates that the occurrence of acute abdomen during pregnancy is associated with multiple factors, including genetic background, environmental factors, and medical history, providing a theoretical foundation for preventive measure development [3]. With advancing medical technology and increasing attention to maternal safety, systematic preventive measures to reduce the incidence of pregnancy-associated acute abdomen have become a key research direction. This study aims to provide scientific evidence for reducing incidence rates and improving treatment outcomes through in-depth analysis of the etiological characteristics of pregnancy-associated acute abdomen and exploration of effective preventive measures.

2. Etiological Research

2.1. Anatomical and Physiological Factors

During pregnancy, women undergo a series of complex physiological and anatomical changes closely related to the occurrence of acute abdomen. As shown in

Figure 1, the gradual enlargement of the uterus leads to significant changes in the position of abdominal organs. For instance, the appendix position progressively elevates with increasing gestational age, potentially rising 5 - 10 centimeters higher than in non-pregnant states [4]. This positional change not only increases diagnostic difficulty but may also lead to atypical disease presentations. The elevated levels of estrogen and progesterone during pregnancy can result in reduced gallbladder contractility and altered bile secretion and excretion, significantly increasing the risk of biliary system diseases. Research has found that late-pregnancy gallbladder contractility can decrease by 30% - 40%, significantly increasing the risk of bile stasis. Additionally, pregnancy-specific immune system changes, including cellular and humoral immunity regulation, may increase the risk of infectious diseases. The compression effect of uterine enlargement on the intestines intensifies with pregnancy progression, potentially leading to decreased intestinal motility and increased risk of intestinal obstruction. The development of hypercoagulability during pregnancy may also increase the risk of thrombotic diseases, subsequently affecting abdominal organ blood supply. The relaxation of abdominal wall muscles and changes in intra-abdominal pressure also affect the clinical presentation of acute abdomen, increasing diagnostic challenges. These combined physiological and anatomical changes make pregnancy a high-risk period for acute abdomen, requiring clinicians to fully understand these characteristic changes to improve diagnostic accuracy. Additionally, altered respiratory mechanics during pregnancy can influence the presentation of acute abdominal conditions, as diaphragmatic elevation affects the distribution of pain and the physical examination findings.

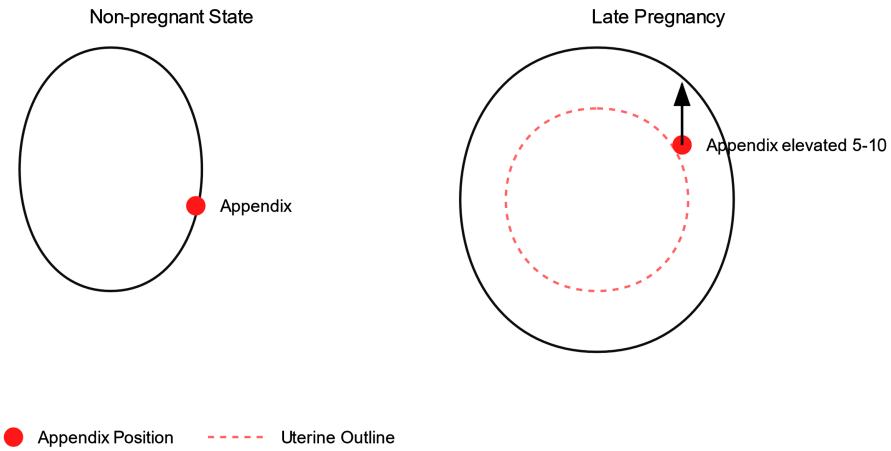

Figure 1. Anatomical changes during pregnancy diagram.

2.2. Environmental and Lifestyle Factors

Environmental factors and lifestyle play important roles in the occurrence of pregnancy-associated acute abdomen. As shown in Figure 2, poor lifestyle habits and environmental factors demonstrate a clear correlation with acute abdomen occurrence [5]. Changes in dietary structure represent a significant factor affecting the

occurrence of digestive system diseases during pregnancy, with high-fat diets not only increasing the risk of biliary system diseases but potentially leading to digestive tract dysfunction. Research indicates that excessive intake of high-fat foods during pregnancy can increase the risk of gallstones by 2 - 3 times. Insufficient dietary fiber intake may lead to constipation, increasing the risk of intestinal obstruction. Work stress and poor psychological state are also significant risk factors, as excessive mental stress may affect digestive system function through neuroendocrine mechanisms, increasing the risk of acute abdomen. The problem of insufficient exercise, particularly prominent in pregnant populations due to modern lifestyle, may lead to weakened intestinal function, increasing the risk of digestive system diseases. Environmental pollution, especially air and water pollution, may increase the risk of infectious diseases by affecting immune function. Occupational factors also warrant attention, as long-term exposure to harmful substances or poor work postures may increase the risk of acute abdomen. Poor sleep quality and irregular rest patterns may affect immune function and endocrine regulation, increasing disease risk. The impact of these environmental and lifestyle factors is often long-term and potential, requiring systematic preventive measures to reduce their harm.

Figure 2. Environmental and lifestyle risk factor analysis diagram.

2.3. Genetic and Medical History Factors

Genetic factors and medical history have significant implications for the occurrence of acute abdomen during pregnancy. As shown in **Figure 3**, pregnant women with specific genetic backgrounds or previous abdominal surgery history demonstrate a significantly increased risk of acute abdomen [6]. Genetic factors

primarily exert their influence through individual metabolic characteristics and immune function, with certain genetic polymorphisms closely associated with acute abdomen susceptibility. Research has found that pregnant women with a family history of gallstones face a 3 - 4 times higher risk of biliary system diseases compared to the general population. Previous cesarean sections or other abdominal surgeries can lead to abdominal adhesions, with these anatomical structural changes increasing the risk of intestinal obstruction. The presence of underlying autoimmune diseases such as systemic lupus erythematosus and inflammatory bowel disease may increase the risk of acute abdomen through effects on immune function and tissue repair capacity. Metabolic diseases such as diabetes may increase the risk of related complications through effects on vascular function and nerve conduction. Previous history of pregnancy complications is also a significant risk factor requiring special attention in subsequent pregnancies. Certain hereditary connective tissue disorders may increase tissue vulnerability, elevating the risk of abdominal organ injury. Therefore, when conducting pre-pregnancy assessments, these genetic and medical history factors should be fully considered to develop individualized prevention plans.

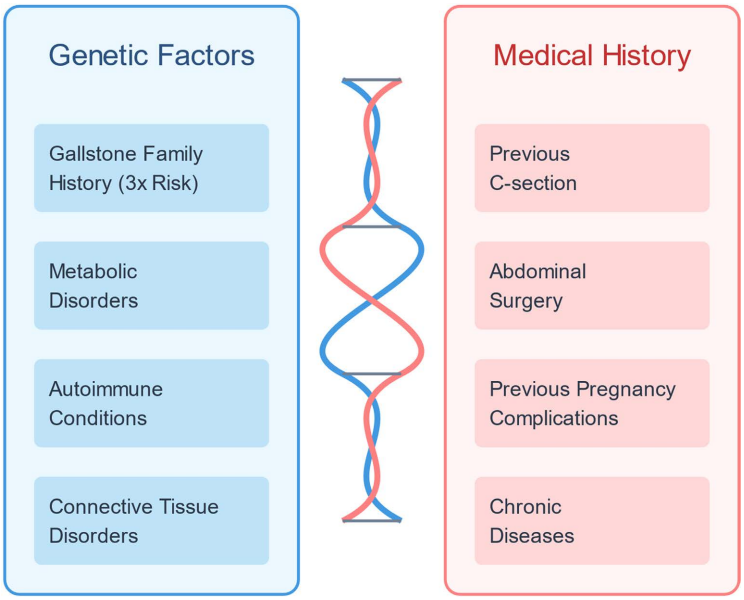

Figure 3. Genetic and medical history correlation analysis diagram.

3. Clinical Features and Diagnosis

3.1. Symptomatology and Evolution Patterns of Acute Abdomen During Pregnancy

The clinical manifestations of pregnancy-associated acute abdomen exhibit unique characteristics and complexity, primarily related to pregnancy-specific physiological and anatomical changes. Abdominal pain is the most common symptom, but its location and nature may appear abnormal due to pregnancy-related uterine enlargement and abdominal organ displacement. The typical pressure point for

acute appendicitis may shift upward with pregnancy progression, leading to inaccurate McBurney's point localization. Nausea and vomiting symptoms can easily be confused with normal pregnancy reactions, increasing the difficulty of early diagnosis. Pregnancy-specific immune system changes may mask typical inflammatory response presentations, making systemic symptoms such as fever less prominent. The accuracy of abdominal physical examination decreases with pregnancy progression, primarily due to changes in abdominal wall muscle tension caused by uterine enlargement. Certain acute abdominal conditions may trigger uterine contractions, presenting symptoms similar to preterm labor and increasing the difficulty of differential diagnosis. Late-pregnancy abdominal pain also needs to be differentiated from obstetric complications such as placenta previa and placental abruption. Digestive system symptoms such as changes in appetite and constipation are relatively common during pregnancy, making it difficult to distinguish between normal pregnancy reactions and pathological changes. As the disease progresses, serious complications such as shock and dehydration may occur, affecting the sensitivity and specificity of routine physical examination signs. Therefore, clinicians need to fully understand the characteristics of pregnancy-associated acute abdomen clinical presentations and conduct comprehensive analysis based on individual patient circumstances.

3.2. Auxiliary Examination Methods

Auxiliary examinations are crucial for the accurate diagnosis of pregnancy-associated acute abdomen. Selecting appropriate imaging and laboratory tests that ensure both safety and diagnostic effectiveness is essential (see **Table 1** and **Figure 4**). Ultrasound examination, being radiation-free and capable of providing real-time dynamic images, is the preferred imaging method. Research indicates that high-resolution ultrasound has a sensitivity exceeding 90% in diagnosing biliary system diseases [7]. While magnetic resonance imaging (MRI) offers more detailed anatomical information, especially useful for identifying abdominal abscesses and intestinal obstructions, it requires a longer examination time. Computed Tomography (CT), although highly accurate and providing rapid results, involves radiation exposure and is generally avoided during pregnancy unless absolutely necessary. In laboratory examinations, changes in inflammatory indicators such as complete blood count, C-reactive protein, and procalcitonin need to be interpreted in conjunction with pregnancy-related physiological changes. Liver and kidney function and electrolyte examinations can help assess disease severity and organ function impairment. Coagulation function tests are significant in evaluating bleeding risk and guiding treatment plan selection. Monitoring trends in laboratory indicators holds more clinical value than single examination results. The application of novel biomarkers such as cytokine profiles and specific enzymatic indicators provides new pathways for improving diagnostic accuracy. Additionally, fetal monitoring is an essential auxiliary examination method, requiring regular assessment of fetal growth development and intrauterine environmental changes.

Table 1. Strengths and weaknesses of diagnostic methods.

Diagnostic Method	Strengths	Weaknesses
Ultrasound	Radiation-free, real-time, high sensitivity	Operator-dependent, limited by maternal BMI
Magnetic Resonance Imaging (MRI)	Detailed anatomical information, no radiation	Longer examination time, higher cost
Computed Tomography (CT)	High accuracy, quick results	Radiation exposure, contraindicated in pregnancy
Laboratory Tests	Non-invasive, widely available	May be influenced by pregnancy-related changes
Fetal Monitoring	Assesses fetal well-being, non-invasive	Requires specialized equipment and expertise

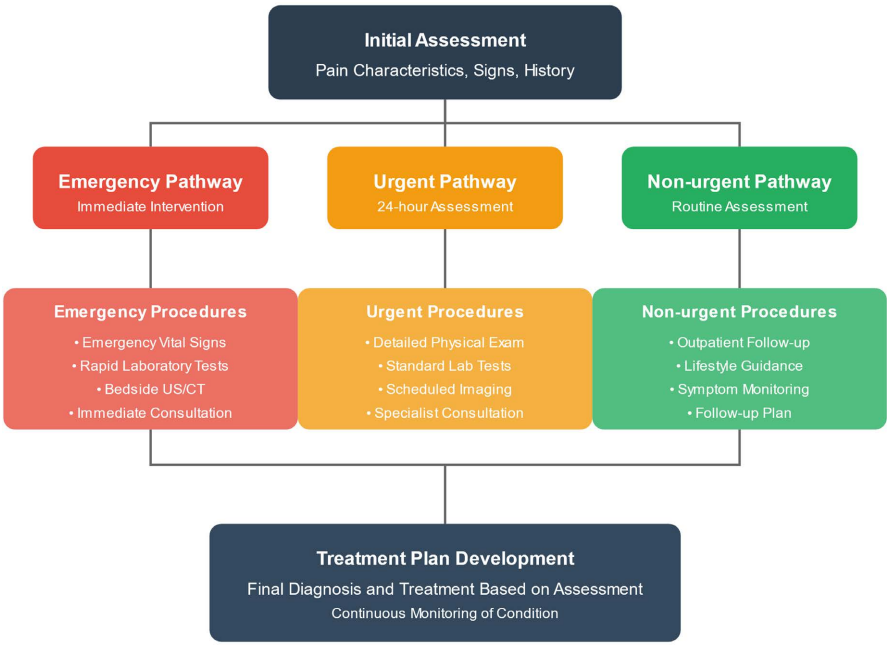

Figure 4. Diagnostic method selection flow chart.

3.3. Key Points of Differential Diagnosis

Differential diagnosis of pregnancy-associated acute abdomen presents special difficulties and challenges, requiring multi-disciplinary collaboration [8]. Obstetric emergencies such as ectopic pregnancy, threatened abortion, and placental abruption need to be ruled out first, as these conditions may present as acute abdominal pain but differ significantly in treatment principles and methods. Urinary system diseases such as pyelonephritis and ureteral calculi are also common differential diagnoses, with notably increased incidence during pregnancy and clinical presentations similar to acute abdomen. Digestive system diseases such as peptic ulcers and pancreatitis may present atypically during pregnancy, increasing differential diagnostic difficulty [9]. Endocrine system diseases such

as thyroid storm may present with acute abdominal pain and digestive tract symptoms, requiring systematic examination and hormone level determination for differentiation. Hematological system diseases such as sickle cell crisis may trigger acute abdomen-like presentations during pregnancy. Pregnancy-specific conditions such as severe preeclampsia may also present with upper abdominal pain, requiring close attention to blood pressure changes and proteinuria. Neurological diseases such as herpes zoster may be misdiagnosed as acute abdomen due to pain preceding rash appearance. Cardiovascular system diseases such as aortic dissection show increased incidence during pregnancy, often presenting with severe abdominal pain. Additionally, certain rare diseases such as pheochromocytoma may first manifest during pregnancy with acute abdomen-like symptoms. Therefore, when conducting differential diagnosis, comprehensive history collection, careful physical examination, rational selection of auxiliary examination methods, and necessary specialist consultations are required to improve diagnostic accuracy.

4. Construction of Prevention Systems

4.1. Pre-Pregnancy Risk Assessment and Intervention Plans

Pre-pregnancy prevention represents a key link in reducing the incidence of pregnancy-associated acute abdomen. Establishing a comprehensive pre-pregnancy assessment system enables screening and intervention for potential high-risk factors [10]. Genetic risk assessment includes detailed family history inquiry and necessary genetic testing, with specialized genetic counseling required for women of childbearing age with hereditary disease family history. Systematic assessment of previous medical history holds significant value in predicting pregnancy complication risks, particularly focusing on abdominal surgery history, autoimmune disease history, and metabolic disease history. Optimized control of chronic diseases represents an important aspect of pre-pregnancy preparation, with conditions such as diabetes and hypertension requiring blood glucose and blood pressure levels to meet pregnancy safety standards. Nutritional status assessment and improvement also constitute important components of pre-pregnancy preparation, recommending nutritional status assessment and guidance to correct potential malnutrition or obesity issues. Mental health assessment and intervention are equally important, recommending psychological consultation and necessary treatment for women of childbearing age with psychological issues. Immune function assessment and regulation can help prevent pregnancy-related infectious diseases. Lifestyle improvements need to begin pre-pregnancy, including smoking cessation, alcohol limitation, balanced diet, and moderate exercise. Occupational environment assessment and adjustment also represent important aspects of pre-pregnancy preparation, recommending timely work position adjustment or protective measures for women of childbearing age with occupational exposure risks.

4.2. Systematic Monitoring and Early Warning Mechanisms during Pregnancy

Systematic monitoring during pregnancy constitutes the core content of acute abdomen prevention. Establishing individualized prenatal examination plans determines examination items and follow-up frequency based on specific circumstances of pregnant women. Regular abdominal examinations observe changes in abdominal symptoms and signs for early detection of potential pathological changes. Ultrasound examination not only monitors fetal development but also observes abdominal organ status, potentially requiring increased examination frequency for pregnant women with special risks. Dynamic monitoring of laboratory examinations holds significant value in assessing disease risk, requiring selection of appropriate examination items based on specific circumstances. Nutritional status monitoring and guidance span the entire pregnancy period, with regular nutritional assessment and dietary guidance preventing malnutrition or excessive nutrition. Mental state monitoring also requires routine implementation, providing psychological support and intervention when necessary. Pregnancy-specific physiological changes may increase certain disease risks, therefore requiring targeted prevention and monitoring. Establishing comprehensive warning systems enables assessment and graded management of potential acute abdomen symptoms and signs. Strengthening health education guides pregnant women to recognize warning symptoms and improve self-monitoring capabilities. Multi-disciplinary collaborative monitoring models can provide more comprehensive health protection, particularly for high-risk pregnant women who may require joint follow-up from multiple specialties. Furthermore, developing a risk stratification tool can aid in identifying high-risk pregnancies by evaluating factors such as genetic predispositions, previous medical history, and lifestyle habits. This tool can facilitate personalized intervention plans and enhance the effectiveness of preventive measures.

4.3. Multi-Center Collaborative Emergency Response Plans

Developing scientifically sound emergency response plans represents the key to ensuring timely and effective treatment of pregnancy-associated acute abdomen. Comprehensive emergency plans should include specific measures for pre-hospital, in-hospital, and referral stages. Pre-hospital emergency system construction needs to consider pregnancy-specific characteristics, equipping specialized rescue equipment and medications while training emergency personnel in pregnancy-specific emergency skills. Establishing in-hospital green channels can significantly reduce treatment time for critical patients, requiring clear departmental responsibilities and optimized diagnostic and treatment processes. Establishing multi-disciplinary joint consultation mechanisms helps improve diagnostic decision accuracy, with relevant departments such as obstetrics, general surgery, and anesthesiology requiring rapid response mechanisms. Emergency supplies storage needs rational configuration based on regional acute abdomen prevalence characteristics, ensuring adequate

supplies during critical moments. Regular training and drills for medical personnel represent important means of improving emergency response capabilities, requiring specific training plans for different types of acute abdomen. Establishing regional collaboration networks enables optimized allocation of medical resources, establishing two-way referral systems ensuring patients receive most appropriate treatment. Information system support holds important value in improving emergency response efficiency, requiring establishment of rapid and accurate information transmission mechanisms. Regular assessment and updating of plans are also essential, requiring continuous optimization and improvement based on practical experience. In addition, integrating telemedicine services into emergency response plans can facilitate quicker consultations and decision-making processes, especially in remote or underserved areas.

5. Conclusion

The prevention and treatment of pregnancy-associated acute abdomen represent a systematic project requiring establishment of comprehensive prevention and treatment systems at multiple levels. Through systematic analysis, this study finds that pregnancy-associated acute abdomen occurrence relates to multiple factors, including anatomical and physiological changes, environmental factors, and genetic background. Establishing a comprehensive management model based on pre-pregnancy prevention, focusing on pregnancy monitoring, and ensuring emergency response plans, represents the key to reducing incidence rates and improving treatment success rates. Future research directions should emphasize development of new diagnostic technologies, formulation of individualized prevention strategies, and establishment of multi-center collaboration networks. Strengthening basic research, exploring pathogenesis in depth, while emphasizing clinical practice experience summary will help further improve prevention and treatment levels. Against the background of continuous medical technology advancement and increasing prevention awareness, the prognosis of pregnancy-associated acute abdomen will necessarily see further improvement, providing stronger protection for maternal and infant safety.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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