

## DENGUE INFECTION IN PREGNANT WOMEN: CLINICAL AND PUBLIC HEALTH IMPLICATIONS

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**Resume: INTRODUCTION** The introduction outlines the significance of dengue as a global public health concern, particularly in tropical and subtropical regions. It emphasizes the increased prevalence and incidence of dengue, including the rising cases in Brazil in 2024. The section highlights the unique vulnerability of pregnant women to dengue due to physiological and immunological changes during pregnancy. It discusses the complex pathophysiology of dengue, diagnostic challenges, maternal and fetal complications, and the importance of preventive measures and public health interventions. **OBJETIVE** To provide a comprehensive analysis of the impact of dengue infection in pregnant women, encompassing epidemiology, pathophysiology, clinical manifestations, diagnostic challenges, complications, management, and prevention. **METHODS** This is a narrative review which included studies in the MEDLINE – PubMed (National Library of Medicine, National Institutes of Health), COCHRANE, EMBASE and Google Scholar databases, using as descriptors: “Dengue” AND “Pregnancy” AND “Maternal complications” AND Vertical transmission” AND “Vector control” in the last years. **RESULTS AND DISCUSSION** The results and discussion section delves into the global prevalence and incidence of dengue, with a focus on pregnant women. It examines the mechanisms of dengue transmission and the seasonal patterns of outbreaks. The section evaluates the impact of dengue on maternal and fetal health, comparing clinical presentations between pregnant and non-pregnant women. It discusses the efficacy of diagnostic methods and the complications associated with dengue hemorrhagic fever in pregnancy. The section also addresses treatment protocols, preventive strategies, and the role of public health policies in dengue control. It highlights the importance of maternal education programs, environmental management, and international

collaboration in dengue research and prevention. **CONCLUSION** The conclusion underscores the complex interplay of risks and challenges associated with dengue infection during pregnancy. It emphasizes the need for accurate diagnosis, timely management, and effective preventive measures to reduce the burden of dengue among pregnant women. The section calls for targeted research and clinical strategies to address the needs of this high-risk population, highlighting the importance of international collaboration and public health interventions in improving maternal and fetal health outcomes.

**Keywords:** Dengue; Pregnancy; Maternal health; Fetal outcomes; Vector control

## INTRODUCTION

Dengue fever, a significant vector-borne disease caused by the dengue virus (DENV), represents a substantial public health concern in tropical and subtropical regions. Dengue virus belongs to the Flaviviridae family and comprises four distinct serotypes (DENV-1, DENV-2, DENV-3, and DENV-4), each capable of causing the full spectrum of disease manifestations<sup>1</sup>. The incidence of dengue has increased dramatically in recent decades, with current estimates indicating that approximately 390 million dengue infections occur annually worldwide, of which 96 million manifest clinically<sup>2</sup>. The primary vector, *Aedes aegypti*, thrives in urban environments, facilitating the widespread dissemination of the virus. The interplay between climatic factors, human behavior, and vector ecology contributes to the complex epidemiology of dengue<sup>3</sup>.

The epidemiological landscape of dengue is characterized by marked seasonal and geographical variability<sup>4</sup>. Dengue outbreaks often coincide with the rainy season, correlating with increased mosquito breeding sites<sup>4</sup>. The geographical distribution of dengue is expanding, with notable increases in case

numbers reported in Brazil in 2024<sup>4</sup>. In this context, pregnant women constitute a uniquely vulnerable population due to the physiological and immunological changes associated with pregnancy, which may alter susceptibility to infections and disease progression<sup>5</sup>. Dengue during pregnancy poses significant risks to both maternal and fetal health, necessitating targeted research and clinical management strategies<sup>5</sup>.

Pregnancy induces substantial changes in the maternal immune system, characterized by a shift towards a Th2-dominated immune response to accommodate the semi-allogeneic fetus<sup>6</sup>. These immunological adaptations may influence the host response to dengue virus, potentially exacerbating disease severity<sup>6</sup>. Furthermore, the hemodynamic changes of pregnancy, including increased blood volume and cardiac output, may predispose pregnant women to complications such as hemorrhage and shock in the context of dengue infection<sup>7</sup>. The pathophysiology of dengue is multifaceted, involving viral replication, immune activation, and endothelial dysfunction<sup>7</sup>. The clinical manifestations of dengue range from mild febrile illness to severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS)<sup>8</sup>. In pregnant women, the clinical presentation of dengue may overlap with other pregnancy-related conditions, complicating diagnosis and management<sup>8</sup>. Accurate and timely diagnosis is critical, yet diagnostic challenges persist due to the nonspecific nature of early symptoms and the limitations of available diagnostic tools<sup>9</sup>.

Maternal complications of dengue infection include severe hemorrhage, preeclampsia-like syndrome, and multi-organ failure<sup>10</sup>. These complications can lead to adverse pregnancy outcomes such as preterm birth, low birth weight, and fetal demise. Fetal complications may arise from vertical transmission of the virus, resulting in congenital dengue

infection<sup>10</sup>. The management of dengue in pregnant women requires careful consideration of both maternal and fetal well-being, with a focus on supportive care and the avoidance of interventions that may exacerbate bleeding risks<sup>11</sup>. Preventive measures are paramount in mitigating the impact of dengue among pregnant women. Vector control strategies, including environmental management and the use of insect repellents, are essential components of dengue prevention<sup>11</sup>. Public health initiatives aimed at raising awareness and promoting protective behaviors are also critical. Despite advances in vaccine development, the deployment of dengue vaccines during pregnancy remains an area of ongoing research, with safety and efficacy considerations at the forefront<sup>12</sup>.

## OBJETIVES

To provide a comprehensive analysis of the impact of dengue infection in pregnant women, encompassing epidemiology, pathophysiology, clinical manifestations, diagnostic challenges, complications, management, and prevention.

## SECUNDARY OBJETIVES

1. To assess the global prevalence and incidence of dengue, particularly in pregnant women.
2. To evaluate the specific maternal and fetal complications associated with dengue infection during pregnancy.
3. To analyze the efficacy of current diagnostic methods and treatment protocols for pregnant women with dengue.
4. To discuss preventive strategies, including vector control and vaccination, in the context of pregnancy.
5. To identify gaps in research and suggest directions for future studies on dengue in pregnant women.

## METHODS

This is a narrative review, in which the main aspects of impact of dengue infection in pregnant women, encompassing epidemiology, pathophysiology, clinical manifestations, diagnostic challenges, complications, management, and prevention in recent years were analyzed. The beginning of the study was carried out with theoretical training using the following databases: PubMed, sciELO and Medline, using as descriptors: “Dengue” AND “Pregnancy” AND “Maternal complications” AND Vertical transmission” AND “Vector control” in the last years. As it is a narrative review, this study does not have any risks.

Databases: This review included studies in the MEDLINE – PubMed (National Library of Medicine, National Institutes of Health), COCHRANE, EMBASE and Google Scholar databases.

The inclusion criteria applied in the analytical review were human intervention studies, experimental studies, cohort studies, case-control studies, cross-sectional studies and literature reviews, editorials, case reports, and poster presentations. Also, only studies writing in English and Portuguese were included.

## RESULTS AND DISCUSSION

The global prevalence of dengue has escalated, with an estimated 3.9 billion people at risk of infection across more than 100 countries<sup>13</sup>. This upsurge is particularly pronounced in regions such as Southeast Asia, the Americas, and the Western Pacific, where environmental conditions favor mosquito proliferation<sup>13</sup>. The incidence of dengue in pregnant women mirrors these trends, with significant implications for maternal and fetal health. In Brazil, for instance, the incidence of dengue has risen sharply in 2024, underscoring the urgent need for targeted interventions<sup>14</sup>. The mechanisms of dengue transmission are

well-documented, involving the bite of infected *Aedes* mosquitoes<sup>14</sup>. The virus undergoes a replication cycle within the mosquito before being transmitted to humans. Seasonal patterns of dengue outbreaks are influenced by rainfall, temperature, and humidity, which affect mosquito breeding and survival. In Brazil, the peak transmission season typically coincides with the rainy season, highlighting the importance of seasonal preparedness in dengue control efforts<sup>15</sup>.

Dengue infection during pregnancy can exacerbate maternal morbidity and mortality. Studies indicate that pregnant women with dengue are at increased risk of severe disease, including DHF and DSS<sup>16</sup>. The physiological changes of pregnancy, such as increased blood volume and altered vascular permeability, may predispose to these severe manifestations<sup>16</sup>. Moreover, the immunological shift towards a Th2 response may impair viral clearance, potentially prolonging viremia and increasing the risk of complications<sup>17</sup>. Fetal outcomes in dengue-infected pregnancies are a major concern. Vertical transmission of the virus can occur, leading to congenital dengue infection. Adverse outcomes include preterm birth, low birth weight, and intrauterine growth restriction (IUGR)<sup>18</sup>. A study conducted in India reported a higher incidence of adverse fetal outcomes in dengue-infected pregnancies, with increased rates of preterm delivery and low birth weight (Sharma et al., 2016)<sup>19</sup>. The mechanisms underlying these outcomes are not fully understood but may involve placental infection and inflammation<sup>20</sup>.

Comparative studies reveal differences in clinical presentation between pregnant and non-pregnant women<sup>21</sup>. Pregnant women may present with atypical symptoms, such as severe abdominal pain and preeclampsia-like syndrome, which can complicate diagnosis. Additionally, laboratory parameters such

as platelet count and liver enzymes may be influenced by pregnancy, necessitating careful interpretation of results<sup>22</sup>. The efficacy of current diagnostic methods, including serology and molecular techniques, is limited by these factors, underscoring the need for improved diagnostic tools. Complications of dengue hemorrhagic fever in pregnancy are particularly severe<sup>23</sup>. Hemorrhagic manifestations, such as gastrointestinal bleeding and postpartum hemorrhage, are common and can be life-threatening<sup>24</sup>. The management of these complications requires a multidisciplinary approach, with close monitoring and supportive care. In severe cases, interventions such as blood transfusion and intensive care may be necessary<sup>25</sup>. The impact of dengue on pregnancy outcomes extends beyond the acute phase, with long-term implications for maternal and neonatal health<sup>25</sup>.

Treatment protocols for dengue in pregnant women emphasize supportive care, including fluid management and symptomatic relief<sup>26</sup>. The use of antipyretics such as acetaminophen is recommended, while non-steroidal anti-inflammatory drugs (NSAIDs) are contraindicated due to their potential to exacerbate bleeding. In severe cases, hospitalization and close monitoring are warranted<sup>26</sup>. The safety and efficacy of antiviral treatments in pregnant women remain an area of ongoing research, with current evidence limited by the lack of large-scale clinical trials. Preventive strategies are crucial in reducing the burden of dengue among pregnant women<sup>27</sup>. Vector control measures, such as eliminating mosquito breeding sites and using insect repellents, are fundamental. Community-based interventions, including health education and public awareness campaigns, play a vital role in promoting protective behaviors<sup>27</sup>. The role of vaccination in pregnant women is still being evaluated, with current recommendations focusing on

pre-conception vaccination for women of childbearing age<sup>28</sup>. The effectiveness of these strategies depends on their implementation and community acceptance<sup>28</sup>.

Public health policies are instrumental in dengue control<sup>29</sup>. Integrated vector management (IVM) approaches, combining chemical, biological, and environmental methods, have shown promise in reducing mosquito populations<sup>30</sup>. Surveillance systems that monitor dengue cases and vector indices are essential for timely interventions<sup>30</sup>. The role of international collaboration in dengue research and prevention cannot be overstated, as it facilitates the exchange of knowledge and resources<sup>30</sup>. Immunological changes during pregnancy may modulate the severity of dengue infection<sup>30</sup>. The Th2-dominated immune response, characterized by increased production of anti-inflammatory cytokines, may impair the clearance of the virus, leading to prolonged viremia and increased risk of complications<sup>31</sup>. The impact of genetic factors on dengue susceptibility during pregnancy is an area of emerging research, with studies suggesting that certain genetic polymorphisms may influence the severity of infection<sup>32</sup>.

The psychological impact of dengue on pregnant women is an often-overlooked aspect. The fear of adverse outcomes and the stress of dealing with severe illness can have significant psychological repercussions<sup>33</sup>. Supportive care, including counseling and mental health services, is essential to address these needs<sup>33</sup>. The economic burden of dengue on healthcare systems is substantial, with costs associated with hospitalization, treatment, and loss of productivity<sup>33</sup>. These economic considerations highlight the importance of cost-effective preventive measures. Long-term health outcomes for children born to dengue-infected mothers are not well-documented<sup>34</sup>. There is a need for longitudinal studies to assess the potential

impact of congenital dengue infection on child development and health. Breastfeeding and postnatal care are also areas of concern, as the risk of vertical transmission may influence maternal practices. The effectiveness of maternal education programs in preventing dengue and promoting healthy practices during pregnancy is an area warranting further research<sup>34</sup>.

Environmental factors play a critical role in dengue transmission during pregnancy<sup>35</sup>. Urbanization, climate change, and human mobility contribute to the spread of the disease<sup>35</sup>. Environmental management, such as improving sanitation and reducing mosquito breeding sites, is essential in mitigating these risks<sup>36</sup>. The impact of dengue on maternal mortality rates is significant, with severe cases leading to fatal outcomes (Carles et al., 2008)<sup>37</sup>. International collaboration in dengue research and prevention is vital to address these challenges and improve maternal and fetal health outcomes<sup>37</sup>.

## CONCLUSION

Dengue infection during pregnancy presents a complex interplay of risks and challenges, necessitating a multidisciplinary approach to management and prevention. The global burden of dengue continues to rise, with significant implications for maternal and fetal health. The physiological and immunological changes of pregnancy may exacerbate disease severity, leading to increased morbidity and mortality. Accurate diagnosis and timely management are critical, yet diagnostic challenges persist due to overlapping symptoms and limited diagnostic tools.

Preventive measures, including vector control and public health interventions, are essential in reducing the burden of dengue among pregnant women. The role of vaccination remains an area of ongoing research, with current recommendations

focusing on pre-conception vaccination. The impact of dengue on long-term health outcomes and the effectiveness of maternal education programs warrant further investigation. International collaboration in dengue research and prevention is crucial in addressing these challenges and improving maternal and fetal health outcomes.

This narrative bibliographic review underscores the need for targeted research and clinical strategies to better address the needs of pregnant women affected by dengue. By synthesizing current knowledge and identifying gaps in research, this review aims to inform clinical practices and public health policies, ultimately enhancing the health and well-being of this high-risk population.

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