

Air Travel and Pregnancy: A Review of Safety, Risks, and Recommendations

Authors:

Dr. Tahseen Parvez Mujawar¹, Dr. Heenazarin Mujawar², Dr. Abdurazak Jumale³

¹Specialist physician Dubai Health

²Specialist DHA

³Senior specialist physician, Dubai health

Corresponding Author:

Dr. Tahseen Parvez Mujawar

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ABSTRACT:

Air travel during pregnancy is a frequent concern for expectant mothers and healthcare providers. While commercial aviation is generally considered safe for healthy pregnancies, certain physiological and environmental factors associated with flight such as reduced cabin pressure, cosmic radiation exposure, prolonged immobility, and emergency medical accessibility may pose potential risks. This study is based on electronic literature using the best available evidence from PubMed, Medline, Google Scholar, the American College of Obstetricians and Gynaecologists (ACOG), the American College of Chest Physicians (ACCP), the Royal College of Obstetricians and Gynaecologists (RCOG), and the British Thoracic Society (BTS). This review synthesizes current literature on the effects of air travel on pregnancy, addressing concerns related to maternal and fetal oxygenation, thromboembolic events, radiation exposure, and pregnancy outcomes such as miscarriage, preterm labor, and fetal growth restriction. Airline policies, travel recommendations, and risk mitigation strategies are discussed to guide clinical practice and inform pregnant travellers.

Keywords: Air travel, pregnancy, healthcare

INTRODUCTION:

With the globalization of business, tourism, and family travel, pregnant individuals are increasingly taking commercial flights. Airlines and healthcare providers must balance the convenience and necessity of air travel against the physiological changes of pregnancy and the in-flight environmental conditions that may influence maternal and fetal well-being. The objective of this review is to evaluate the existing literature regarding air travel during pregnancy, identify potential risks, and provide evidence-based recommendations for pregnant travellers and their healthcare providers.

Physiological Considerations in Air Travel

During Pregnancy:

1. Hypobaric Hypoxia and Fetal Oxygenation:

Commercial aircraft cabins are typically pressurized to an equivalent altitude of 6,000–8,000 feet above sea level, resulting in a lower partial pressure of oxygen than at sea level. While healthy pregnant individuals can physiologically compensate for mild hypoxia through increased maternal ventilation and placental

oxygen transfer, certain high-risk pregnancies may be more vulnerable to hypoxic stress (1,2).

Key Findings:

- Studies show that maternal arterial oxygen saturation remains above 90% at typical cabin pressures, with minimal impact on fetal oxygenation in uncomplicated pregnancies (3,4).
- Pregnancies complicated by anaemia, cardiovascular disease, or placental insufficiency may experience a greater degree of hypoxic compromise (5).
- Doppler ultrasound studies indicate that fetal blood flow redistribution occurs in response to mild maternal hypoxia, with increased cerebral perfusion observed in some cases (6).

Clinical Implications:

- Routine air travel is unlikely to cause fetal distress in healthy pregnancies.
- Pregnant individuals with high-risk conditions (e.g., preeclampsia,

- intrauterine growth restriction) should undergo individualized risk assessments before flying.
- Supplemental oxygen may be warranted for those with pre-existing hypoxia or pulmonary conditions.

2. Radiation Exposure and Teratogenic Risk

Pregnant travellers and airline crew are exposed to cosmic ionizing radiation during flights, with doses varying based on altitude, latitude, and flight duration. A single transatlantic flight exposes passengers to approximately 0.03–0.1 mSv, which is significantly below the International Commission on Radiological Protection (ICRP) threshold of 1 mSv for fetal exposure during pregnancy (7).

Key Findings:

- Studies indicate that occasional air travel poses negligible radiation risk to the developing fetus (8,9).
- Airline pilots and cabin crew with frequent exposure may exceed recommended radiation limits over time (10).
- Some research suggests a slightly increased risk of miscarriage and fetal growth restriction among flight attendants with high cumulative exposure (11)
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Clinical Implications:

- Pregnant individuals with occasional air travel do not need to modify their flight plans due to radiation concerns.

- Airline employees and frequent flyers should track cumulative radiation exposure and adhere to occupational safety guidelines.

3. Risk of Venous Thromboembolism (VTE):

Pregnancy is associated with a hypercoagulable state, increasing the risk of venous thromboembolism (VTE), particularly during prolonged periods of immobility, as occurs on long-haul flights.

Key Findings:

- Pregnant travellers have a 2–4 times higher risk of developing deep vein thrombosis (DVT) compared to non-pregnant individuals (12).
- The incidence of travel-related DVT is estimated to be 1 in 4,656 flights longer than four hours (13).
- Studies show that using compression stockings and performing in-flight leg exercises can reduce VTE risk by up to 50% (14).
- Clinical Implications:
- Pregnant individuals traveling on long-haul flights (>4 hours) should wear compression stockings and perform periodic in-flight movement.
- Those with additional risk factors for thrombosis (e.g., personal or family history of DVT, thrombophilia, obesity) should consider low-dose aspirin or prophylactic anticoagulation in consultation with their physician.

Table 1 highlights the risk factors and the recommendations for prevention of travel-related VTE [8-9].

Simple preventive proceedings as indicated in Table 2 can be used to reduce the risk of VTE; nevertheless pharmacological thrombosis-prophylaxis is not in general indicated.

Table 1: Risk factors and recommendations to reduce the risk of travel-related VTE.(17)

Risk group	Risk factor	Recommendations
• Low-risk	- No additional risk factor	General measures: exercises, walking, normal fluid intake, avoid alcohol and caffeine consumption
• Medium-risk	- Pregnancy, postpartum period, age over 60 years, family history of VTE, large varicose veins, chronic venous insufficiency, oral contraceptives, hormone replacement therapy, obesity (BMI over 30 kg/m ²)	General measures: as above, Compression stockings
• High-risk	- Previous VTE, recent major surgery, malignant disease or severe illness, and immobilization	General measures: as above, compression stockings, consider low-molecular weight heparin

Table 2: Recommendations to reduce the risk of VTE in pregnancy.(17)

Choosing an aisle seat: a easier way to exercise
Taking regular walks on board: periodic movement of the lower extremities
Exercises in every 30 minutes: advised for medium or long-haul flights (> 4 hours)

Avoid of restrictive clothing
Hydration: maintain a good fluid intake, avoid dehydration: minimise coffee and alcohol
Individualised risk assessment for thrombosis with aspirin, low weight heparin molecules

4. Pregnancy Outcomes and Air Travel:

Several epidemiological studies have examined whether air travel is associated with increased risks of miscarriage, preterm birth, or fetal growth restriction.

Key Findings:

- Rumbold et al. (2019) found no significant increase in miscarriage rates among pregnant air travellers (15).
- A systematic review by Hezelgrave et al. (2022) concluded that preterm birth risk was not elevated in occasional travellers but may be slightly higher among those with frequent long-haul flights (16).
- A study of flight attendants showed a modestly increased risk of small-for-gestational-age infants, potentially linked to prolonged standing rather than flying itself

Clinical Implications:

Air travel is not contraindicated in uncomplicated pregnancies but should be avoided in cases of cervical insufficiency, placenta previa, or preterm labor risk.

5. Guidelines for Safe Air Travel During Pregnancy:

1. Airline Policies:

Most airlines permit pregnant passengers to travel until:

- 36 weeks for single pregnancies.
- 32 weeks for multiple pregnancies.
- After 28 weeks, some airlines require a medical certificate confirming fitness to fly
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- 32 weeks for multiple pregnancies.
- After 28 weeks, some airlines require a medical certificate confirming fitness to fly

2. Pre-Flight Considerations

- Consult with a healthcare provider, particularly for high-risk pregnancies.
- Carry a copy of prenatal records in case of medical emergencies.
- Choose an aisle seat for easier access to restrooms and movement.

3. In-Flight Recommendations

- Stay hydrated to prevent dehydration and reduce VTE risk.
- Perform leg exercises and walk periodically to improve circulation.
- Wear compression stockings for long-haul flights.
- Position seat belts below the abdomen for safety.

Table 3: Air travel is contraindicated in the following medical complications.(17)

• Obstetrical or gynecological complications:
• Cervical insufficiency
• Active labor or preterm labor
• Placenta praevia, placenta insufficiency, placental abruption
• Premature rupture of membranes
• Abortus imminent or incomplete
• Severe anaemia: haemoglobin < 7,5 g/dl
• Vaginal bleeding
• Ectopic pregnancy
• Other medical complications:
• Otitis media and sinusitis
• Serious cardiac or pulmonal disease: unstable angina, cardiomyopathy, congestive heart failure, pulmonary hypertension
• Renal insufficiency
• Sickle cell anaemia: recent crisis
• Recent gastrointestinal surgery: including gastrointestinal suture
• VTE
• Fracture: where leg swelling can occur in flight

CONCLUSION:

For most pregnant individuals, air travel is safe when appropriate precautions are taken. However, those with high-risk pregnancies should undergo thorough risk assessments before flying. Airline policies should continue to evolve based on emerging research to better accommodate pregnant travelers. Future studies should focus on the cumulative effects of frequent flying on pregnancy outcomes, particularly for airline crew members and business travelers.

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