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Causes of Bleeding During the First Trimester of Pregnancy (Review Article)

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ABSTRACT

Vaginal bleeding during the first trimester of pregnancy is one of the most common obstetric complications, affecting approximately one-quarter of pregnant women. This condition can range from mild, benign spotting to severe, life-threatening hemorrhage and serves as a significant indicator for adverse maternal and fetal outcomes—such as spontaneous abortion, preterm birth, low birth weight, preterm premature rupture of membranes (PPROM), placental abruption, placenta previa, and stillbirth.

The causes of first-trimester bleeding are broadly categorized into obstetric and non-obstetric etiologies. Among obstetric causes, threatened miscarriage is the most frequent diagnosis; other significant causes include early pregnancy loss, ectopic pregnancy, and gestational trophoblastic disease (GTD). Non-obstetric causes include genital tract infections, cervical polyps, cervical lesions or ulcers, and subchorionic hematomas. Subchorionic hematoma is a common sonographic finding; when large, it is associated with an increased risk of miscarriage and other pregnancy complications.

Diagnosing the cause of bleeding requires a thorough clinical evaluation, laboratory testing, and diagnostic imaging. Transvaginal ultrasound, the imaging modality of choice, plays a pivotal role in the differential diagnosis, measurement of serum β-hCG and progesterone levels can assist in distinguishing between normal and abnormal pregnancies. Several risk factors are associated with an increased likelihood of first-trimester bleeding, including maternal age (over 35 or under 20), recurrent miscarriage, smoking and alcohol consumption, obesity, excessive caffeine intake, diabetes, hypertension, thyroid disorders, uterine abnormalities (such as fibroids or a uterine septum), fetal aneuploidy, infections, the use of assisted reproductive technologies, psychosocial factors, and domestic violence.

Since some causes of bleeding (such as fetal chromosomal abnormalities) are beyond the mother's control, it is not possible to prevent every instance; however, identifying and addressing modifiable risk factors can help reduce the likelihood of spontaneous miscarriage and certain causes of bleeding. Key preventive strategies include lifestyle modifications (e.g., quitting smoking, weight management, and reducing caffeine intake), the management of underlying medical conditions (such as diabetes and thyroid disorders), the assessment of structural uterine abnormalities, preconception care, and early monitoring. Transvaginal ultrasound in early pregnancy, along with serial monitoring in selected women, can facilitate the early detection of abnormal pregnancies and help mitigate severe outcomes. For women experiencing a threatened miscarriage (particularly those with recurrent miscarriag miscarriage) progesterone therapy may increase the likelihood of a live birth; however, its routine administration is not recommended for all women. Furthermore, there is insufficient evidence to support the use of bed rest or the routine administration of tranexamic acid for the prevention of miscarriage or bleeding. The appropriate approach for women experiencing first-trimester bleeding should be based on diagnosing the cause of the bleeding, assessing the status of both the mother and the fetus, identifying modifiable risk factors, and providing targeted treatment for the underlying cause.

Keywords: First-trimester bleeding, threatened miscarriage, ectopic pregnancy, gestational trophoblastic disease, subchorionic hematoma, risk factors, prevention.

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Introduction

Vaginal bleeding during the first trimester of pregnancy is one of the most common obstetric complications, affecting approximately one-quarter of pregnant women [1]. This condition can range from mild, benign spotting to severe, life-threatening hemorrhage and is considered an important indicator of adverse maternal and fetal outcomes [2]. The differential diagnosis for bleeding during this period encompasses a wide spectrum of causes—ranging from benign to serious—including threatened miscarriage, early pregnancy loss, ectopic pregnancy, gestational trophoblastic disease (GTD), and non-obstetric causes such as cervical polyps or infections [3,4].

Clinically, first-trimester bleeding is associated with an increased risk of spontaneous miscarriage, preterm birth, low birth weight (LBW), preterm premature rupture of membranes (PROM), placental abruption, placenta previa, and stillbirth [5,6]. While many pregnancies complicated by bleeding proceed without further issues, identifying the underlying cause and predicting pregnancy outcomes in cases involving first-trimester bleeding remains a major challenge in the field of obstetrics and gynecology [7]. According to studies, approximately 50% of women who present with vaginal bleeding and a threatened miscarriage ultimately experience a miscarriage [8].

The causes of first-trimester bleeding can be broadly categorized into two groups: obstetric and non-obstetric. In the field of obstetrics, "threatened miscarriage" is the most common diagnosis; it is defined as vaginal bleeding occurring before the 20th week of gestation, accompanied by detectable fetal cardiac activity and a closed cervix upon clinical examination [9]. Early pregnancy loss (spontaneous miscarriage) is another significant cause, in which the pregnancy terminates before the 20th or 24th week (depending on the definition used) [10]. Ectopic pregnancy, while less common (occurring in 1–2% of cases), represents a life-threatening emergency.

It should be considered in any pregnant woman presenting with bleeding and abdominal pain [11]. Gestational trophoblastic disease (GTD)—which includes complete and partial hydatidiform moles—is another cause of bleeding; it is characterized by the abnormal proliferation of trophoblastic tissue and, if not diagnosed and treated promptly, can progress to gestational trophoblastic neoplasia (GTN) [12,13]. A subchorionic hematoma is another obstetric cause of vaginal bleeding during the first half of pregnancy, though it occurs less frequently in the second trimester. This condition arises from the partial detachment of the chorionic membrane from the decidua basalis, resulting in the accumulation of blood in the space between these two structures. Clinical presentation can range from spotting and vaginal bleeding to significant hemorrhage; in some cases, it is discovered incidentally during an ultrasound examination. Diagnosis is primarily established via ultrasound, which typically reveals a crescent-shaped collection (varying in echogenicity) adjacent to the chorionic membrane or the placental margin. The clinical significance of such a hematoma depends on factors including its size, location, the extent of the detachment, and the gestational age at the time of diagnosis. Large hematomas (particularly retroplacental types) may be associated with an increased risk of complications such as placental abruption, preterm premature rupture of membranes (PPROM), intrauterine growth restriction (IUGR), and preterm birth. However, the association between hematomas and adverse pregnancy outcomes varies across studies; findings, especially those from the second trimester, should therefore be interpreted with caution [15,16]. Among non-obstetric causes, genital tract infections, cervical polyps, and cervical ulcers or lesions are the most significant factors to consider [14].

Diagnosing the cause of bleeding during the first trimester of pregnancy requires a thorough clinical, laboratory, and imaging evaluation. Transvaginal ultrasound, the imaging modality of choice, plays a pivotal role in the differential diagnosis; it can confirm the presence of a gestational sac, fetal cardiac activity, gestational age, and placental location [17]. Measuring human chorionic gonadotropin (HCG) levels is also a crucial tool for distinguishing between normal and abnormal pregnancies. Levels of this hormone exceeding 1,500–3,000 mIU/mL are typically associated with the visualization of an intrauterine pregnancy via transvaginal ultrasound [18]. Serum progesterone measurement can also be useful in differentiating between a viable and a non-viable pregnancy; a progesterone level below 6 nmol/L (1.9 ng/mL) effectively rules out a viable pregnancy, with a negative predictive value of 99% [19].

Despite significant advancements in the diagnosis and management of first-trimester bleeding, this condition remains a source of considerable anxiety and uncertainty for parents [20]. A primary reason for this is the lack of precise tools to predict pregnancy outcomes in women who experience bleeding during the first trimester [21]. In recent years, numerous studies have investigated first-trimester sonographic and biochemical markers as predictors of pregnancy outcomes; however, the findings have been inconsistent and contradictory [22,23]. For instance, some studies have suggested that yolk sac size, fetal heart rate, and the volume of a subchorionic hematoma may be useful in predicting miscarriage, whereas other studies have failed to confirm such an association [24,25]. In this context, Gestational trophoblastic disease (GTD) (a heterogeneous group of rare tumors) is of particular clinical significance. These conditions are characterized by the abnormal proliferation of trophoblastic tissue and include complete

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hydatidiform mole (CHM) and partial hydatidiform mole (PHM) [26]. Although these disorders are generally considered benign, they can progress to gestational trophoblastic neoplasia(GTN), which encompasses invasive mole, choriocarcinoma, placental site trophoblastic tumor, and epithelioid trophoblastic tumor [27]. Vaginal bleeding is the most common presenting symptom in patients with GTD and is sometimes accompanied by the passage of hydropic villi [28]. Given the relatively high prevalence of gestational trophoblastic disease (GTD) (approximately 1 case per 1,000 pregnancies) and its potential for malignancy, early diagnosis and appropriate management of this condition are of great importance [29].

In addition to obstetric causes, numerous risk factors are associated with an increased likelihood of first-trimester bleeding and its adverse outcomes. These factors include advanced maternal age (over 35 years), recurrent miscarriage, smoking and alcohol consumption, obesity, diabetes, hypertension, and thyroid disorders [30,31]. Furthermore, uterine abnormalities (such as fibroids, a uterine septum, or a bicornuate uterus) can increase the risk of bleeding and miscarriage [32]. Identifying these risk factors can assist clinicians in providing more targeted care and preventing adverse outcomes [33]. Given the high prevalence of first-trimester bleeding, the diversity of its underlying causes, and the potentially serious consequences for both the mother and the fetus, a comprehensive and systematic review of the etiologies of this condition is warranted. This review article aims to examine and synthesize existing evidence regarding the causes of first-trimester bleeding, with a focus on differential diagnosis, risk factors, and associated clinical outcomes. Such a review can assist healthcare providers in clinical decision-making and the improved management of these patients, while also laying the groundwork for future research in this field.

Predisposing Factors

Bleeding during the first trimester of pregnancy is a multifactorial condition that may arise from a wide range of maternal, fetal, and environmental causes. Identifying the predisposing factors that contribute to this condition plays a key role in its prediction, prevention, and appropriate management [1]. These factors can be categorized into several broad groups: demographic and maternal factors, lifestyle-related factors, obstetric history, anatomical and structural factors, medical conditions and comorbidities, and factors specific to the current pregnancy [2].

Demographic and Maternal Factors:

Maternal age is one of the most significant risk factors for first-trimester bleeding. Studies have shown that women over the age of 35, as well as those under 20, are at a higher risk of experiencing bleeding and adverse pregnancy outcomes [32,33]. In a study conducted by Sangeetha et al., the majority of participants (61.8%) fell within the 21–30 age range; this aligns with findings by Hasan et al., who noted a higher prevalence of bleeding among women aged 20 to 30 [22,29]. Furthermore, Knudsen et al. reported that the risk of recurrent miscarriage is elevated in women under 20 and over 35 years of age [33].

Lifestyle-Related Factors:

Smoking, alcohol consumption, obesity, and excessive caffeine intake are considered modifiable risk factors for first-trimester bleeding. In a meta-analysis, Castles et al. demonstrated that smoking during pregnancy is associated with an increased risk of spontaneous miscarriage and other adverse outcomes [30]. Greenwood et al. also reported that high caffeine consumption can impair placental development and increase the risk of miscarriage and stillbirth [34]. Approximately 25% of spontaneous miscarriages are potentially preventable if modifiable risk factors—such as smoking and obesity—are addressed [35].

Obstetric History-Related Factors:

Recurrent miscarriage is one of the strongest predictors of bleeding and adverse outcomes in subsequent pregnancies. Women who have experienced at least one previous miscarriage are at a higher risk for recurrent miscarriage and other pregnancy complications [39]. In the PRISM study, a post hoc analysis indicated that, among women with at least one prior miscarriage, treatment with progesterone increased the likelihood of a live birth [12]. Furthermore, a history of ectopic pregnancy, uterine anomalies, and the mother's control are factors that elevate the risk of first-trimester bleeding [6,43]. Saravelos et al. also noted an increased risk of bleeding in multiparous women with uterine anomalies or scars from previous surgeries [31].

Anatomic and Structural Factors:

Structural uterine anomalies—such as fibroids, uterine septa, a bicornuate uterus, and intrauterine adhesions—can disrupt implantation and placental development, thereby increasing the risk of bleeding and miscarriage [43]. In a study by Benson et al., the presence of uterine leiomyomas during the first trimester was associated with an increased risk of spontaneous miscarriage [37]. Similarly, in a prospective cohort study, Hartmann et al. confirmed the link between uterine fibroids and the risk of miscarriage [2].

Medical Factors and Comorbidities:

Conditions such as diabetes, hypertension, and thyroid disorders are comorbidities associated with an increased risk of first-trimester bleeding and adverse pregnancy outcomes [20]. In a study by Sangeetha et al., diabetes was observed in 4.6% and hypertension in

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2.3% of women who experienced first-trimester bleeding [22]. Wendland et al. also highlighted the impact of gestational diabetes on pregnancy outcomes [38]. Thyroid disorders and polycystic ovary syndrome (PCOS) have been identified as potential risk factors in some studies, although findings in this regard are inconsistent [39,40]. Furthermore, maternal thrombophilia and coagulation disorders may be associated with an increased risk of bleeding and miscarriage [26].

Factors related to the current pregnancy:
Gestational age at the onset of bleeding, the severity of the bleeding, and the presence of a subchorionic hematoma are among the factors that influence pregnancy outcomes [24]. Studies have shown that heavy bleeding, as well as bleeding accompanied by pain, is associated with an increased risk of pregnancy loss [25]. In a study by Sangeetha et al., the severity of bleeding was categorized into three patterns—spotting, mild bleeding, and heavy bleeding—and a significant association was observed between the severity of bleeding and adverse pregnancy outcomes, such as preterm birth, low birth weight, and admission to the neonatal intensive care unit (NICU) [22]. Furthermore, the presence of a subchorionic hematoma—detected via first-trimester ultrasound—is linked to an increased risk of miscarriage and other pregnancy complications, particularly if the hematoma is large [26,27].

Factors related to chromosomal and genetic abnormalities:
Fetal aneuploidy is the most common cause of pregnancy loss, accounting for approximately 60% of spontaneous miscarriages [28]. Chromosomal abnormalities, such as trisomy 13, 18, and 21, as well as monosomy X, are significant causes of miscarriage during the first trimester [29]. In some cases, parental genetic abnormalities can also increase the risk of recurrent miscarriage and bleeding [30].

Factors related to placental abnormalities:
Placental disorders—such as placenta previa, placental abruption, and gestational trophoblastic disease (GTD)—are significant causes of bleeding during the first trimester of pregnancy [31].
Gestational trophoblastic disease (GTD)—which includes complete and partial hydatidiform moles—is characterized by the abnormal proliferation of trophoblastic tissue; vaginal bleeding is the most common presenting symptom in these patients [32]. Early diagnosis of GTD is of critical importance, as, if left untreated, it can progress to Gestational Trophoblastic Neoplasia (GTN) [33].

Factors related to infections:
Genital tract infections (particularly sexually transmitted infections such as chlamydia trachomatis and neisseria gonorrhoeae) can increase the risk of bleeding and miscarriage by causing inflammation and damage to uterine tissue (34). Furthermore, intra-amniotic infections and chorioamnionitis can trigger uterine contractions and lead to bleeding [35].

Factors Related to Assisted Reproductive Technologies (ART):
The use of assisted reproductive methods, such as in vitro fertilization (IVF) and embryo transfer, may be associated with an increased risk of first-trimester bleeding and miscarriage. In a study, De Sutter et al. demonstrated that first-trimester bleeding is more common in pregnancies resulting from assisted reproductive technologies [43].

Psychosocial Factors:
Maternal stress, anxiety, and depression can negatively affect pregnancy outcomes [38]. Furthermore, low socioeconomic status, low educational attainment, and a lack of access to adequate healthcare are factors linked to an increased risk of bleeding and adverse pregnancy outcomes [39]. In a study by Sangeetha et al., it was found that among women experiencing severe bleeding, low socioeconomic status, and comorbidities, the risk of miscarriage and adverse maternal outcomes was significantly elevated [22].

Factors Related to Domestic Violence:
Exposure to domestic violence during pregnancy may be associated with an increased risk of bleeding, miscarriage, and low birth weight [40]. In a meta-analysis, Karimi et al. demonstrated a significant association between violence during pregnancy and low birth weight [44].
Overall, recognizing these underlying factors can assist healthcare providers in identifying at-risk women, conducting more precise monitoring, and implementing timely interventions. However, many of these factors overlap, necessitating a comprehensive and multifaceted approach to management [44].
Preventive Measures Regarding Bleeding in the First Trimester of Pregnancy
Given that vaginal bleeding during the first trimester of pregnancy has multiple causes (some of which, such as fetal chromosomal abnormalities, are beyond the maternal control) it is not possible to prevent all instances of bleeding. Nevertheless, identifying and addressing modifiable risk factors can help reduce the likelihood of spontaneous miscarriage and certain causes of early pregnancy bleeding. One of the most significant preventive steps involves modifying lifestyle-related factors, both before and during pregnancy; existing evidence indicates that certain behavioral and metabolic factors are associated with an increased risk of pregnancy loss and adverse outcomes [37].

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Modification of Lifestyle Factors

- Smoking cessation is considered one of the most critical modifiable measures for reducing the risk of pregnancy complications. Studies have shown that smoking during pregnancy is associated with impaired placental function and an increased risk of adverse pregnancy outcomes, including pregnancy loss. Therefore, quitting smoking prior to conception and strictly avoiding it throughout pregnancy should be emphasized as a fundamental component of both preconception and prenatal care [30].
- Weight management and the prevention of obesity are also key measures for reducing the risk of spontaneous miscarriage; research on miscarriage risk factors has linked maternal obesity to a higher likelihood of pregnancy loss. Based on existing evidence, if modifiable risk factors—such as smoking and obesity—are controlled, a significant proportion of spontaneous miscarriages could potentially be prevented [35].
- Reducing excessive caffeine intake is another recommended care measure during pregnancy, as high caffeine consumption has been linked to an increased risk of certain adverse outcomes, including late miscarriage and stillbirth. Consequently, assessing caffeine consumption patterns among women of reproductive age and advising them to limit intake—especially during pregnancy—can serve as a preventive strategy within early pregnancy care [34].

Identification and Management of Underlying Conditions

Proper management of a mother's underlying medical conditions is also a vital component of preventive care, as certain metabolic and endocrine disorders can be associated with adverse pregnancy outcomes [38,39].

- **Diabetes**

Diabetes (particularly when blood sugar is poorly controlled) is a factor associated with an increased risk of pregnancy complications. Therefore, identifying diabetes prior to pregnancy and achieving adequate metabolic control can help reduce the risk of adverse pregnancy outcomes [38].

- **Thyroid Disorders**

Regarding thyroid disorders, it is important to evaluate and treat confirmed cases based on the patient's clinical status. However, the evidence linking various thyroid disorders to adverse outcomes in the first trimester is not uniform; therefore, an isolated laboratory abnormality should not automatically be considered the definitive cause of bleeding [39].

- **History of Miscarriage**

Identifying women with recurrent miscarriage is particularly important, as repeated pregnancy loss may indicate underlying genetic, anatomical, endocrine, or other factors that affect the maintenance of a pregnancy [40]. In women with recurrent miscarriage, a targeted pre-pregnancy evaluation can help identify treatable factors—such as uterine anomalies—thereby facilitating the appropriate management of a subsequent pregnancy [34,40].

- **Structural Uterine Anomalies**

Structural uterine anomalies should also be considered in women with a history of pregnancy loss or other risk factors, as congenital uterine malformations can be associated with adverse reproductive and pregnancy outcomes [31]. Consequently, evaluating uterine structure in selected women (especially those with recurrent miscarriage or other suspicious clinical findings) can be effective in identifying underlying causes and determining appropriate pre-pregnancy interventions [31,40]. Pre-pregnancy Care and Early Monitoring

One of the most important strategies for reducing complications associated with bleeding is the early initiation of prenatal care and the prompt assessment of women experiencing bleeding; this is because bleeding during the first trimester can range from a relatively benign finding to an indication of miscarriage, ectopic pregnancy, or other serious disorders [3,4].

Transvaginal ultrasound in early pregnancy plays a crucial role in determining the location of the pregnancy, assessing fetal viability, and identifying certain causes of bleeding; its appropriate use can facilitate the early diagnosis of abnormal pregnancies [4,7,14,17].

In women presenting with bleeding, the simultaneous assessment of clinical symptoms, the severity of bleeding, pain, β-hCG levels, and sonographic findings aids in distinguishing a normal intrauterine pregnancy from early miscarriage or an ectopic pregnancy [3,4,11].

This approach is particularly significant for preventing the severe consequences of hemorrhage; early diagnosis of an ectopic pregnancy (or other dangerous etiologies) allows for timely intervention before the onset of profuse bleeding or hemodynamic instability [4,11].

In cases where an ectopic pregnancy is suspected, rapid evaluation and the selection of an appropriate treatment (based on the patient's clinical status and diagnostic criteria) are of fundamental importance, as an ectopic pregnancy is a potentially life-threatening cause of first-trimester bleeding [11,36].

The Role of Progesterone in Women with Threatened Miscarriage

For women experiencing first-trimester bleeding in the presence of a viable intrauterine pregnancy, progesterone therapy is one of the interventions investigated for reducing the risk of pregnancy loss.

Progesterone plays a crucial role in maintaining the endometrium and establishing and sustaining an environment conducive to pregnancy; consequently, its potential therapeutic utility in certain women with threatened miscarriage has been a subject of interest.

Current evidence suggests that the efficacy of progesterone varies among women presenting with

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bleeding; the strongest evidence supports its use in women who, in addition to experiencing first-trimester bleeding, also have recurrent miscarriage. In women with multiple prior miscarriages, progesterone can increase the likelihood of a live birth; consequently, for this group of patients, the use of progesterone is considered a treatment option for threatened miscarriage.

Conversely, evidence supporting the routine administration of progesterone to all women experiencing first-trimester bleeding—particularly those with no history of prior miscarriage—is more limited; therefore, it cannot be recommended as a general approach for preventing bleeding or miscarriage.

Accordingly, the decision to prescribe progesterone should be based on the confirmation of a viable intrauterine pregnancy, the patient's history of prior miscarriages, and her specific clinical circumstances, rather than being based solely on the observation of bleeding [21].

The Role of Sonographic Monitoring in Mitigating the Consequences of Bleeding

Although ultrasound cannot directly prevent the occurrence of bleeding, careful and early monitoring of high-risk pregnancies facilitates the prompt identification of factors associated with pregnancy loss and other complications [7,14,17].

Assessing features such as fetal heart rate, fetal growth, characteristics of the gestational sac, and the presence of a subchorionic hematoma can assist in determining the prognosis of a pregnancy following an episode of bleeding [7,15,23].

A subchorionic hematoma is a significant sonographic finding in women experiencing first-trimester bleeding; its presence is associated with an increased likelihood of certain adverse pregnancy outcomes [15,16,25]. In such cases, identifying a hematoma—and evaluating its size and location—can aid in risk stratification and determining the intensity of follow-up care; however, the presence of a hematoma does not, in [15,16].

Consequently, for select women—particularly those with persistent bleeding or initial abnormal findings—serial ultrasound examinations can help monitor the progression of the pregnancy and facilitate the early detection of adverse changes [7,23].

Interventions Not Routinely Recommended for Preventing Bleeding or Miscarriage

Despite the traditional recommendation of bed rest for women experiencing first-trimester bleeding, existing evidence does not support its efficacy in reducing the risk of pregnancy loss. Strict bed rest not only lacks robust evidence for the prevention of miscarriage but can also lead to adverse outcomes resulting from physical inactivity and restricted movement; therefore, it should not be recommended as a routine intervention to prevent miscarriage or bleeding [3,9].

Similarly, the use of pharmacological anti hemorrhagic treatments (such as tranexamic acid) to prevent complications associated with a threatened miscarriage currently lacks sufficient evidence and cannot be recommended as a standard preventive measure for these patients [3].

Consequently, the appropriate clinical approach for women experiencing first-trimester bleeding should focus on diagnosing the cause of the bleeding, assessing the status of both the mother and the fetus, identifying modifiable risk factors, and providing targeted treatment for the underlying cause while avoiding interventions that lack sufficient supporting evidence [3,4].

Preventing Severe Hemorrhage in Key First-Trimester Conditions

Preventing the severe consequences of hemorrhage requires the early identification of potentially dangerous conditions, such as ectopic pregnancy and gestational trophoblastic disease [11-13].

In cases of ectopic pregnancy, early diagnosis (based on a combination of clinical symptoms, β-hCG level measurements, and ultrasound) can prevent the condition from progressing to tubal rupture and severe intra-abdominal hemorrhage [11,36].

Similarly, in gestational trophoblastic disease, the widespread use of ultrasound during early pregnancy has facilitated the earlier detection of molar pregnancy, allowing for identification before many severe complications arise. For women with a molar pregnancy, appropriate uterine evacuation and regular follow-up of hCG levels are crucial; timely detection and treatment of persistent gestational trophoblastic disease can prevent disease progression and serious complications, including hemorrhage [12,13].

Conclusion

Vaginal bleeding during the first trimester is one of the most common obstetric complications, affecting approximately one-quarter of pregnant women. It can range from mild, benign spotting to severe, life-threatening hemorrhage [1,2]. This condition serves as an important indicator for adverse maternal and fetal outcomes, such as spontaneous abortion, preterm birth, low birth weight, preterm premature rupture of membranes (PPROM), placental abruption, placenta previa, and stillbirth [5,6]. The differential diagnosis for bleeding during this period encompasses a wide spectrum of causes, ranging from benign to serious conditions. These include threatened miscarriage, early pregnancy loss, ectopic pregnancy, gestational trophoblastic disease (GTD), and non-obstetric causes such as cervical polyps or infections [3,4].

Causes of first-trimester bleeding can be broadly categorized into obstetric and non-obstetric [9]. Within the obstetric category, threatened miscarriage is the most common diagnosis; it is defined as vaginal bleeding occurring before the 20th week of gestation,

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accompanied by detectable fetal cardiac activity and a closed cervix upon clinical examination [9]. Early pregnancy loss (spontaneous abortion)—where the pregnancy terminates before the 20th or 24th week—is another significant cause [10]. Although less common (occurring in 1–2% of cases), ectopic pregnancy is a life-threatening emergency that must be considered in any pregnant woman presenting with bleeding and abdominal pain [11]. Gestational trophoblastic disease (GTD)—which includes complete and partial hydatidiform moles—is characterized by the abnormal proliferation of trophoblastic tissue; if not diagnosed and treated promptly, it can progress to gestational trophoblastic neoplasia (GTN) [12,13]. Non-obstetric causes include genital tract infections, cervical polyps, cervical ulcers or lesions, and subchorionic hematomas [14]. A subchorionic hematoma refers to an accumulation of blood between the chorionic membrane and the uterine wall; it is a common sonographic finding in women experiencing first-trimester bleeding [15]. Studies have indicated that the size and extent of the hematoma may be associated with adverse pregnancy outcomes [16]. Determining the cause of bleeding during the first trimester of pregnancy requires a thorough clinical, laboratory, and imaging evaluation [17]. Transvaginal ultrasound, the imaging modality of choice, plays a pivotal role in the differential diagnosis; it can identify the presence of a gestational sac, fetal cardiac activity, gestational age, and the location of the placenta [17]. Measuring human chorionic gonadotropin (β-hCG) levels is also a crucial tool for distinguishing between normal and abnormal pregnancies; levels of this hormone exceeding 1,500–3,000 mIU/mL are typically associated with the visualization of an intrauterine pregnancy via transvaginal ultrasound [18]. Serum progesterone measurement can also be useful in differentiating between a viable and a non-viable pregnancy; a progesterone level below 6 nmol/L—with a negative predictive value of 99%—effectively rules out a viable pregnancy [19].

Several risk factors are associated with an increased likelihood of first-trimester bleeding and its adverse outcomes [30,31]. These factors include advanced maternal age (over 35 years) as well as maternal age under 20, recurrent miscarriage, smoking and alcohol consumption, obesity, excessive caffeine intake, diabetes, hypertension, and thyroid disorders [30-33]. Furthermore, uterine abnormalities—such as fibroids or a uterine septum—can elevate the risk of bleeding and miscarriage [32,37]. Recurrent miscarriage is one of the strongest predictors of bleeding and adverse outcomes in subsequent pregnancies [39]. Fetal aneuploidy is the most common cause of pregnancy loss, accounting for approximately 60% of spontaneous miscarriages [28]. The use of assisted reproductive technologies, such as in vitro fertilization (IVF), may also be associated with an increased risk of first-trimester bleeding and miscarriage [43]. Psychosocial factors—including stress, anxiety, depression, low socioeconomic status, lack of access to adequate healthcare, and exposure to domestic violence during pregnancy—are linked to an increased risk of bleeding, miscarriage, and low birth weight [38,39,40,44].

Despite significant advances in the diagnosis and management of bleeding in the first trimester of pregnancy, this condition is still associated with great anxiety and uncertainty for parents [20]. One of the main reasons for this issue is the lack of accurate tools to predict the outcome of pregnancy in women with bleeding [21]. In recent years, several studies have investigated sonographic and biochemical markers of the first trimester as predictors of pregnancy outcome, but the results of these studies have been heterogeneous and contradictory [22,23]. For example, some studies have shown that yolk sac size, fetal heart rate, and subchorionic hematoma volume can be useful in predicting miscarriage, while other studies have not confirmed this association [24,25].

Considering that vaginal bleeding in the first trimester of pregnancy has many causes and some of these causes, including fetal chromosomal abnormalities, are beyond the mother's control, it is not possible to prevent all cases of bleeding. However, identifying and correcting modifiable risk factors can be effective in reducing the probability of spontaneous abortion and some causes of early pregnancy bleeding [35]. Modifying lifestyle factors such as smoking cessation, weight control and obesity prevention, and reducing excessive caffeine consumption are among the most important modifiable measures to reduce the risk of pregnancy complications [30,34,35]. Proper control of maternal underlying diseases such as diabetes and thyroid disorders is also considered an important component of preventive care [38,39]. Identifying women with recurrent miscarriages particularly important, because a history of repeated pregnancy loss can indicate the presence of underlying genetic, anatomical, endocrine or other factors affecting the continuation of pregnancy [40]. Uterine structural abnormalities should also be considered in women with a history of pregnancy loss or other risk factors [31].

Pre-pregnancy care and early monitoring is one of the most important strategies to reduce complications related to bleeding [3,4]. Transvaginal ultrasound in early pregnancy plays an important role in determining the location of pregnancy, evaluating fetal life and identifying some causes of bleeding, and its proper use can enable early diagnosis of abnormal pregnancies [4,7,14,17]. In cases where there is a possibility of ectopic pregnancy, quick evaluation and selection of appropriate treatment based on clinical status and diagnostic criteria is essential, because ectopic pregnancy is one of the potentially life-threatening causes of first trimester bleeding [11,36]. In gestational trophoblastic disease, the widespread use of

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ultrasound in early pregnancy has made it possible to diagnose molar disease earlier, and in women with molar pregnancy, proper evacuation of the uterus and regular follow-up of hCG levels are very important [12,13].

In women experiencing first-trimester bleeding with a viable intrauterine pregnancy, treatment with progesterone is one of the interventions investigated to reduce the risk of pregnancy loss [21].

Existing evidence indicates that the efficacy of progesterone varies among women presenting with bleeding; the strongest evidence supports its use in women who, in addition to experiencing first-trimester bleeding, have recurrent miscarriage [21]. For women with recurrent miscarriage, progesterone may increase the likelihood of a live birth [12]. Conversely, evidence supporting the routine administration of progesterone to all women with first-trimester bleeding—particularly those with no prior history of miscarriage—is more limited; therefore, it cannot be recommended as a universal strategy for preventing bleeding or miscarriage [21]. Consequently, the decision to prescribe progesterone should be based on the confirmation of a viable intrauterine pregnancy, the patient's history of miscarriage, and her specific clinical circumstances, rather than being based solely on the presence of bleeding [21].

Although ultrasound cannot directly prevent bleeding, careful and early monitoring of at-risk pregnancies facilitates the prompt identification of factors associated with pregnancy loss and other complications [7,14,17]. Assessing parameters such as fetal heart rate, fetal growth, characteristics of the gestational sac, and the presence of a subchorionic hematoma can assist in determining the prognosis of a pregnancy following an episode of bleeding [7,15,23]. A subchorionic hematoma is a significant sonographic finding in women experiencing first-trimester bleeding, and its presence has been associated with an increased risk of certain adverse pregnancy outcomes [15,16,25]. In such cases, identifying the hematoma and assessing its size and location can assist in risk stratification and determining the intensity of follow-up; however, the presence of a hematoma does not inherently signify an inevitable pregnancy loss [15,16]. Consequently, serial ultrasound examinations in selected women—particularly when bleeding persists or initial abnormal findings are present—can aid in monitoring the progression of the pregnancy and facilitating the early detection of adverse changes [7,23].

Although bed rest has traditionally been recommended for women with first-trimester bleeding, existing evidence does not support its efficacy in reducing the risk of pregnancy loss; therefore, it should not be advised as a routine intervention to prevent miscarriage or bleeding [3,9]. Similarly, the use of pharmacological hemostatic agents, such as tranexamic acid, to prevent complications associated with threatened miscarriage lacks sufficient supporting evidence and cannot be recommended as a standard preventive measure for these patients [3]. Ultimately, the appropriate clinical approach for women with first-trimester bleeding should focus on diagnosing the cause of the bleeding, assessing the status of both the mother and the fetus, identifying modifiable risk factors, and providing targeted treatment for the underlying etiology, while avoiding interventions that lack sufficient evidence [3,4]. In general, given the high prevalence of first-trimester bleeding, the diversity of its underlying causes, and the potentially serious consequences for both the mother and the fetus, a comprehensive and multifaceted approach to managing this condition is essential [44]. Identifying predisposing factors can assist healthcare providers in recognizing women at risk, facilitating closer monitoring, and enabling timely interventions [44]. However, many of these factors overlap, further necessitating a comprehensive and multifaceted management strategy [44]. Preventing severe outcomes associated with bleeding requires the early identification of potentially dangerous causes, such as ectopic pregnancy and gestational trophoblastic disease [11-13]. Early diagnosis of an ectopic pregnancy—based on a combination of clinical symptoms, β-hCG measurements, and ultrasound—can prevent the condition from progressing to tubal rupture and severe intra-abdominal hemorrhage [11,364]. Similarly, in cases of gestational trophoblastic disease, early diagnosis and prompt treatment of persistent disease can prevent further progression and the development of serious complications, including hemorrhage [12,13]. Ultimately, despite the challenges inherent in predicting pregnancy outcomes for women experiencing first-trimester bleeding, focusing on modifiable risk factors, ensuring close and early monitoring, and providing targeted treatment for the underlying cause can effectively improve maternal and fetal outcomes [3,4,7,21].

Ethical Considerations

This study is a review article based on the review and analysis of previously published sources and studies. In this study, no intervention or primary data collection was performed from patients, and no personal or identifiable information of patients was used; therefore, the principles of confidentiality, privacy, and individual rights were respected, and obtaining a code of ethics was not necessary for this study.

Conflict of Interests

There was no conflict of interest in this study.

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