Recurrent Preterm Premature Rupture of Membranes in a Patient with Failure Conservative Treatment, Leading to Placental Abruption with Preterm Delivery: A Case Report

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Abstract
Introduction: Preterm Premature Rupture of Membranes in premature labor refers to the rupture of the amniotic sac before 37 weeks of gestation. PPROM is one of the most common complications during pregnancy and can lead to more serious risks for both the mother and the fetus. While premature labor is the most prevalent complication associated with PROM, it is important to note that placental abruption, though rare, can also occur concurrently.
Case: A 24-year-old woman with a gestational age of 30-31 weeks has been treated conservatively at 27-28 weeks of gestation and returned to the hospital with complaints of watery discharge and blood spots. Physical examination found abdominal tenderness and defans. From the internal examination, it was found that there was no amniotic fluid with a cervical opening of 3-4 cm, and the bleeding was blackish-red. The patient was diagnosed with G2P1A0 (second pregnancy, one live birth, and no abortions) at 30-31 weeks with placental abruption lasting more than 24 hours and failed conservative treatment. An emergency cesarean section was performed and the infant was placed under NICU care.
Discussion: The infection and inflammatory process following conservative treatment can be a cause behind placental abruption in mothers. The primary management approach involves monitoring the vital signs of both the mother and the fetus. This assessment is crucial in determining the best next steps, and a cesarean section is often expected to ensure the safety of both the fetus and the mother.
Conclusion: Placental abruption is a serious obstetric emergency that can endanger both the mother and the fetus. The most prevalent cause of abruption is an infection inflammatory reaction in the uterus. While PPROM rarely triggers placental abruption, it did occur in this case.

Keywords: Premature rupture of Membrane, Placental abruption, Infection, Inflammation

Rekurensi Ketuban Pecah Dini pada Pasien Gagal Perawatan Konservatif Yang Menyebabkan Solusio Plasenta dan Persalinan Prematur

Abstrak
Pendahuluan: Ketuban pecah dini pada persalinan prematur merupakan pecahnya lapisan ketuban sebelum usia 37 minggu. Ini merupakan kondisi komplikasi yang paling sering terjadi pada kehamilan dan dapat memunculkan komplikasi yang lebih serius pada ibu dan janin. Komplikasi ketuban pecah dini paling sering adalah pada persalinan prematur. Namun demikian, adanya solusio plasenta pada persalinan prematur masih jarang terjadi.
Kasus: Wanita 24 tahun dengan usia kehamilan 30 - 31 minggu telah dirawat secara konservatif pada saat usia kehamilan 27 - 28 minggu datang kembali ke rumah sakit dengan keluhan keluar air dan bercak darah. Dari pemeriksaan fisik, diketahui adanya nyeri tekan pada perut dan defans. Saat pemeriksaan dalam, tidak ditemukan adanya ketuban, namun terdapat pembukaan pada serviks 3 - 4 cm dan adanya perdarahan berwarna merah kehitaman. Pasien didiagnosis dengan G2P1A0 30-31 minggu dengan solusio plasenta ketuban pecah dini durasi >24 jam dan gagal rawat konservatif. Dilakukan *sectio cesarea* emergensi dan perawatan NICU untuk bayi.
Diskusi: Adanya proses infeksi-inflamasi post perawatan konservatif menjadi salah satu mekanisme terjadinya solusio plasenta pada ibu. Tatalaksana berupa pemantauan tanda vital ibu dan janin, ini menjadi prinsip utama dalam penentuan langkah berikutnya dan operasi *sectio sesarea* diharapkan dapat menyelamatkan janin dan ibu.
Kesimpulan: Solusio plasenta merupakan salah satu kegawatdaruratan obstetri yang berpotensi membahayakan ibu dan janin. Ada banyak faktor pencetus solusio dan yang paling sering di antaranya adalah adanya reaksi infeksi-inflamasi dalam uterus. Ketuban pecah dini menjadi pencetus yang jarang ditemukan pada kasus solusio plasenta, namun ditemukan pada kasus ini.

Kata kunci:Inflamasi, Infeksi, Ketuban Pecah Dini, Solusio Plasenta

 DOI: 10.24198/obgynia.v8i1.802

Introduction

Preterm Premature Rupture of Membrane (PPROM) is a condition of rupture of the amniotic sac in pregnancy before 37 weeks. PPROM is the most prevalent complication during pregnancy. [1] According to WHO, PPROM occurs in 3-4% of pregnancies among mothers worldwide. In 40-50% of these conditions, complications such as preterm birth, aspiration in babies at birth, and fetal death occur.[2] The etiology of PPROM is not yet known for certain. However, risk factors for preterm premature rupture of membranes include intra-uterine infection as well as oxidative stress and malnutrition in the mother. Infection is the greatest risk factor for the incidence of PPROM; around 25-35% of mothers experience infection outside the womb in the occurrence of PPROM.[3] According to the WHO, the incidence rate of PPROM was 12.3% of all births in 2020, with the majority occurring in developing countries.[2] Based on the data from the Ministry of Health of Republic Indonesia, the incidence of PPROM ranges from 6% to 10% of the pregnancy.[3]

The most common symptoms of PPROM include the discharge of water in pregnant women without contractions from the mother's uterus, which can be accompanied by symptoms of infection outside the womb such as ARI (Acute Respiratory Infection), UTI (Urinary Track Infection), and Gingivitis.[1] The PPROM diagnose is very simple: use litmus paper to check the mother's fluid for a change from red to blue. Patients diagnosed with PPROM must have an ultrasound to see if there are signs of labor or if the baby must be delivered right away.[3]

Complications of PPROM include preterm birth, which causes respiratory distress in the baby, umbilical cord prolapse when the water breaks, and placental abruption, which can increase maternal and infant mortality. [6] Placental abruption is a condition in which the placenta separates from the uterine wall, resulting in intrauterine hemmorrhage. Placental abruption is a dangerous condition for both the mother and the baby. PPROM that induces placental abruption affects 5-7% of all patients with PPROM.[2] The occurrence of complications from PPROM that result in placental abruption is quite rare, especially when conservative treatment has been used. This case report provides an overview of PPROM cases that can lead to placental abruption.

Case Report

A 24-year-old G2P1A0 woman was admitted to the hospital three weeks ago for preterm premature rupture of membranes in a G2P1A0 Gravida pregnancy that was 27–28 weeks along. She received conservative treatment, which included the intravenous administration of dexametasone 6 mg over 12 hours for two days, Ceftriaxone 1 gr every 12 hours for three days, and some tocolytics. The patient has undergone two outpatient check-ups after one week hospitalized. After 2 days of check-ups, the patient came to the ER with complaints of heartburn for the last 2 days, and more often 6 hours ago. There was bleeding from the vagina accompanied by severe abdominal pain 6 hours before admission with the amount of bleeding 1 pad. The fetal movement was still felt with the estimated last weight of the fetus was 1.6 kg. History of painful urination, lots of itchy, and smelly vaginal discharge was denied, history of high blood pressure, blood sugar or diabetes, and asthma before or during pregnancy was denied. The history of cavities was denied. The patient routinely had check-ups with an obstetrician every 1 month and every week after being hospitalized.

The patient's vital signs are as follows: Blood Pressure (BP) is 120/80 mmHg, Heart Rate (HR) is 89 beats per minute, Respiratory Rate (RR) is 21 breaths per minute, and

Temperature (T) is 36.5°C. Upon external examination, the height of the uterine fundus is 25 cm, while the Fetal Heart Rate (FHR) is 152 beats per minute. The patient's abdominal examination reveals that the uterus is hard, irregular, and board-like.

In the Leopold maneuvers: Leopold I shows that the fetal buttocks are palpable, Leopold II shows a small fetal part on the patient's right side, Leopold III shows that head is palpable, and Leopold IV shows that the baby's head is above the pelvic inlet where the thick and soft portion is checked. Amniotic fluid is unclear and there are positive findings of blackish blood. The cervical opening is approximately 3 cm dilated, with Hodge's station at -1.

The patient was diagnosed as G2P1A0 at 30-31 weeks gestation, with placental abruption and preterm premature rupture of membranes (PPROM) that lasted more than 24 hours, and conservative management failed. She received intravenous (IV) fluids and intrauterine resuscitation with a rapid bolus of 500cc Lactated Ringer's solution. In addition, she was administered 1 gram of ceftriaxone IV for antibiotics and 1 gram of tranexamic acid via IV.

An emergency cesarean section was planned. The baby was born unresponsive, without immediate crying, and exhibited weak muscle tone. The birth weight was 1690 grams, with an Apgar score of 6 at 1 minute and 8 at 5 minutes. A New Ballard Score examination indicated a level equivalent to 31 weeks of gestational age. After the initial resuscitation, the baby's heart rate was 130 beats per minute, accompanied by groaning and subcostal retractions. Subsequently, nasal Continuous Positive Airway Pressure (nCPAP) was initiated at 40% FIO_2 using a Neo T-piece resuscitator. After resuscitation, the patient was transferred to the Neonatal Intensive Care Unit (NICU). The baby underwent a Thorax X-ray and come with neonatal pneumonia. Ncpap was given for three days, and tappering of oxygen demand with nasal, antibiotics was given ampicilyn

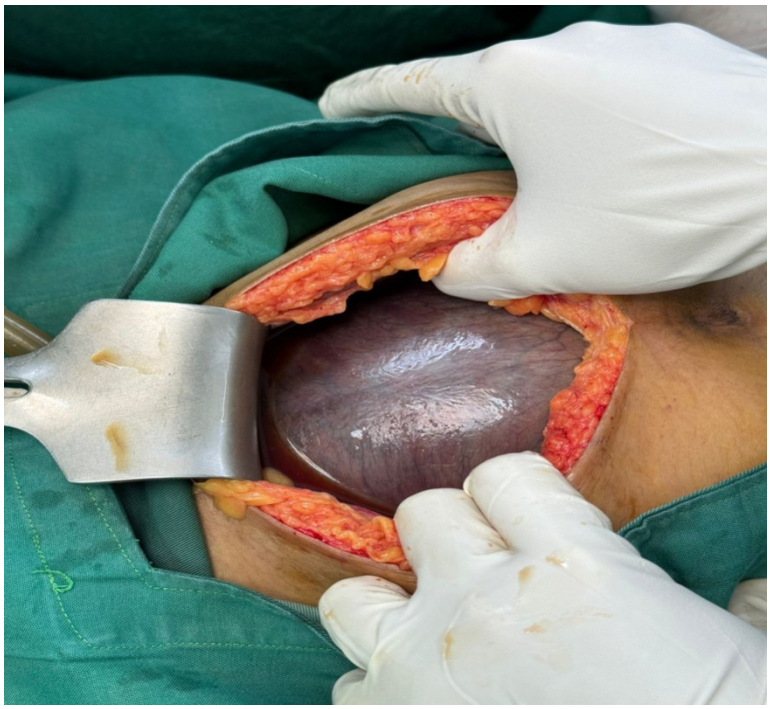

Figure 1 The surgical opening shows a hematoma in the anterior part of the uterus and uterine Couvelaire indicates placental abruption

Table 1 Patient Hematology Profile

Hematology	Result	Normal Value
Hemoglobin	11.9g/dl	12.3-15.3 g/dl
Hematocrit	35.50 %	36-45%
Leukocytes	16.400/ul	4,400-11.300/ul
Platelets	246.000 /ul	150.000-450.00/ul
MCV	85.10 FL	80-86 Fl
MCH	28.50 pg/mL	33.00-36.00
MCHC	33.20 g/dl	33-36g/dl
Differential Count		
Basofil	0.1%	0-1%
Eosinofil	0.1%	1-6%
Neutriphil Rod	0%	2-6%
Neutrophil Segment	78.7%	50-70%
Limfosit	15.4%	20-40%
Monosit	5.7%	2-9%
Blood Type – Rhesus		
Blood Type	A	
Rhesus	Positive	
Haemostasis		
Bleeding Time	3.00 minutes	1-3 minutes
Clotting Time	5.00 minutes	1-6 minutes
Clinical Chemistry		
Random Blood Glucose	73 mg/dl	< 100 mg/dl
Imunoserology		
HbsAg	Non Reactive	Non Reactive
Anti- HIV	Non Reactive	Non Reactive
Hematology	Result	Normal Value
Hemoglobin	11.6 g/dl	12.3-15.3 g/dl
Hematocrit	35.73%	36-45%
Leukocytes	11.010 /ul	4.400-11.300/ul
Platelets	267000 /ul	150.000-450.00/ul
MCV	84 FL	80-86 Fl
MCH	25.40 pg/mL	33.00-36.00
MCHC	32.20 g/dl	33-36g/dl

surbactam 85mg per 12 hours and gentamicyn 80 mg per 24 hours for a week. After one week, the baby can go home safely.

After cesarean section, the patient was adminstered to a regular hospitalized, her hematology routine checked after 6 hours operation, and the patient was given ringerlactate solution with 20 UI oxytocin 28 drops per minutes until 12 hours after operation, ceftriaxone 1gr per 12 hours, and tranexamat acid 500mg per 12 hours. The patient was observed every 4 hours for vital signs.

Three weeks beforehand patient come to ER with chief complaint a watery discharge from the birth canal, was treated for conservatives for 3 days with antibiotics and steroid givens for lungs maturity, 10 days beforehand patient control is outpatient and gynecologist specialist for futher evaluation suggest for evaluation next week, two days before patient control is outpatient obstetrics and gynecologist specialist for futher evaluation, the next two days the patient come to ER with chief complaint a watery dicharge from the birth canal with bloody-blackedrish and had to undergo an emergency cesarean section.

Disscusion

Placental abruption is an emergency condition in which the placenta detaches from the uterine wall (myometrium). This detachment is often initiated by bleeding from the decidua basalis, which disrupts the adhesive layer connecting the placenta to the myometrium and might result in the formation of a hematoma at the site of adhesion.[1] There are two main causes of placental abruption: trauma and chronic medical conditions. This complication occurs in approximately 0.6% to 1.2% of all pregnancies and is responsible for 10% to 12% of maternal deaths. The significant intrauterine bleeding associated with placental abruption, making it a critical emergency for both the mother and the fetus.[7]

The American Journal of Obstetrics & Gynecology identifies several risk factors for placental abruption, including chronic hypertension (Relative Risk 1.8-5.1), pre-eclampsia (Relative Risk 2.0-4.5), eclampsia (Relative Risk 3.0-5.5), polyhydramnios (Relative Risk 2.0-3.0), and premature rupture of membranes (Relative Risk 1.8-5.1). According to this research, the patient is at a higher risk of premature rupture of membranes, which increases her chances of experiencing placental abruption by 2 to 4 times, having a significant influence on her condition. Furthermore, the correlation between premature rupture of membranes and placental abruption is particularly strong; between 22 and 32 weeks of gestation, approximately one in three mothers who experience premature rupture of membranes also have placental abruption.[8]

The mechanism of placental abruption, particularly when triggered by repeated premature rupture of membranes, is most commonly associated with infection in the amniotic fluid or the presence of an inflammatory process in the body and uterus. This inflammatory response can stimulate the immune systems of both the mother and the fetus.

While the exact mechanism behind placental abruption is not fully understood, it is believed that the maternal inflammatory process releases immune cells such as T-cells, NK cells, macrophages, and dendritic cells. This response acts as a maternal defense against infection. The decidual cells in the placenta have receptors that resemble bacterial components, allowing immune cells to attach to the decidua of the placenta. As a result, inflammatory processes accumulate, potentially damaging the decidua of the placenta. This damage may ultimately cause the detachment of the placenta from the myometrium, resulting in placental abruption.[8] This case involves an

Tabel 2 Risk factors for Placental Abruption from AJOG[7]

Variable	Relative Risk or odd ratio	Influence
Chronic Hypertension	1.8-5.1	+++
Pregestational Diabetes	2.5-3.0	++
Gestational Diabetes	0.7-0.8	+/-
Gestational Hipertension	1.5-2.5	++
Pre Eclampsia	2.0-4.5	+++
Eclampsia	3.0-5.5	+++
Polyhidramnion	2.0-3.0	++
Oligohidramnion	2.0-2.5	++
PPROM	1.8-5.1	++
Chorioamnionitis	2.0-2.5	++
Gemeli	2.0-2.5	++

acute inflammatory process resulting from an imbalance between T-cells and NK-cells in the mother. According to some sources, an accumulation of cytotoxic responses during inflammation might attack and damage the placental decidua that adheres to the uterus. In this instance, the patient first experienced a rupture of membranes, which was followed by conservative treatment. Two weeks later, the patient faced another premature rupture of membranes, accompanied by placental abruption. This indicates that the mother's inflammatory infection process continued from the first premature rupture of membranes to the second.[7]

Premature rupture of membranes (PROM) is a factor that might trigger placental abruption. Although the precise origin of PROM is unknown, a number of risk factors are identified. These include bacterial infections originating from within the uterus (25.5% of cases) and from outside the uterus (74.5%), as well as abdominal trauma, polyhydramnios, multiple pregnancies, and a history of placental abruption.[1,9] Premature rupture of membranes (PROM) is classified into two categories: low-risk and high-risk. Low-risk PROM involves a minor release of amniotic fluid that does not lead to preterm birth or pose significant risks to the fetus. A significant amniotic fluid release, on the other hand, is a characteristic of high-risk PROM. This can lower the volume of fluid surrounding the fetus, potentially putting its health at risk and inciting early labor.[9] Upon admission to the hospital, the patient was diagnosed with low-risk PROM, which allowed for the preservation of the fetus and conservative pregnancy treatment. However, two weeks into treatment, the patient's condition worsened to high-risk PROM with placental abruption, demanding immediate emergency intervention.

The pathophysiology of rupture of membranes itself is most often in the supra-cervical area (the amniotic membrane that covers the ostium cervix).[9] The presence of changes in the structure of the amniotic fluid is characterized by swelling and disruption of collagen in the fibroblasts, flexible layers of the amniotic fluid, changes in collagen MMP-1, MMP-8, and MMP-9 which make the flexibility of the amniotic fluid stiff. Interleukin-8 macrophages and cytokines are released throughout the inflammatory process, causing an imbalance between collagen MMP-9 and MMP-8.[9] Bacterial invasion is a predisposing factor, according to Degulio et al., who conducted PCR (polymerase chain reaction) examinations on 20% of premature

Tabel 3 Patient Hematology and Urinalysis Profile

Hematology	Result	Normal Value
Hemoglobin	12.6 g/dl	12.3-15.3 g/dl
Hematocrit	37.90%	36-45%
Leukocytes	14.530/ul	4.400-11.300/ul
Platelets	313.000 juta/ul	150.000-450.00/ul
MCV	88.60 FL	80-86 Fl
MCH	29.40 pg/mL	33.00-36.00
MCHC	33.20 g/dl	33-36g/dl
Clinical Chemistry		
Random Blood Glucose	73 mg,dl	< 100 mg/dl
Imunoserology		
HbsAg	Non Reactive	Non Reactive
Urinalysis	Result	Normal Value
Mass	1.020	1.001-1.0035
PH	7.0	5.0-8.0
Erytrocyte	++	Negative
Bilirubin urine	Negative	Negative
Urobillinogen urine	0.1 mg/dl	Negative
Urine ketones	Negative	Negative
Urine glucose	Negative	Negative
Urine protein	++	Negative
Nitrite	Negative	Negative
Urine leukocytes	+++	Negative
Eristrcytes sediment	7-8 /LBP	0-3/ LBP
Leukocytes sediment	>50 /LBP	0-8/LBP
Epithelial	6-8/LBP	
Cylindrical	Negative	Negative
Bacterial	++ / LBP	Negative
Crystal	Negative	Negative

rupture of amniotic fluid and found bacterial invasion of 45%, which causes the release of more inflammatory mediators and might lead to chorioamnionitis.[10] The stiffness of certain areas of the amniotic layer can create fragile spots that, when subjected to mechanical stress, may lead to tears in the amniotic membrane and result in premature rupture of membranes. In such cases, routine blood tests and urine tests can be used to confirm the presence of an infectious inflammatory reaction. These tests typically show an increase in white blood cells in the blood and urine, and bacteria can be detected in the urine under microscope.[9]

Hematology and urine examinations indicated continuing infections and inflammatory reactions. This suggests that the inflammatory process in the patient is active, resulting in an ascending infection that could produce lesions affecting placental adhesion.

In this instance, placental abruption is happening abruptly. This means that there is infection and inflammation, which disrupt the attachment of the placenta to the endometrial

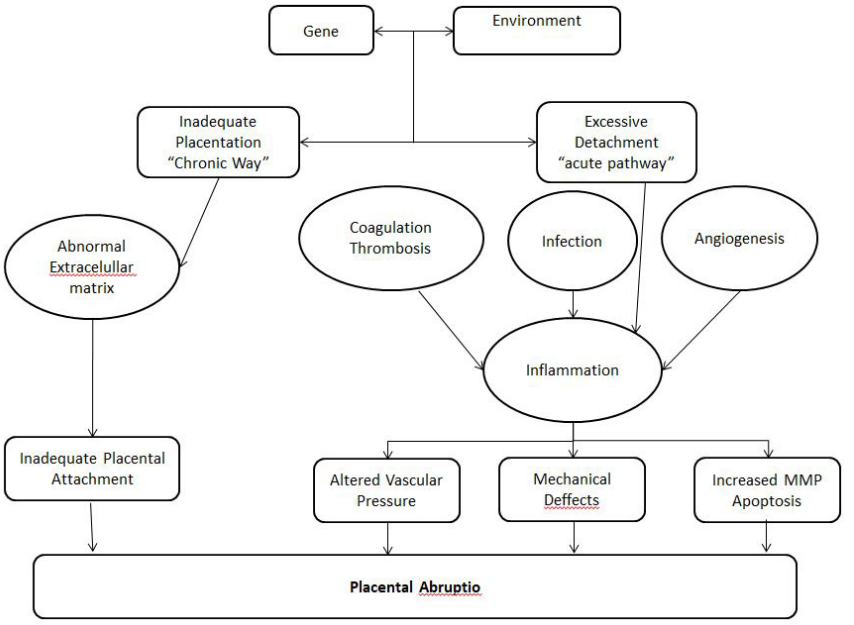

Figure 2 Pathogenesis of placental abruption according to American Journal of Obstetrics and Gynecologist

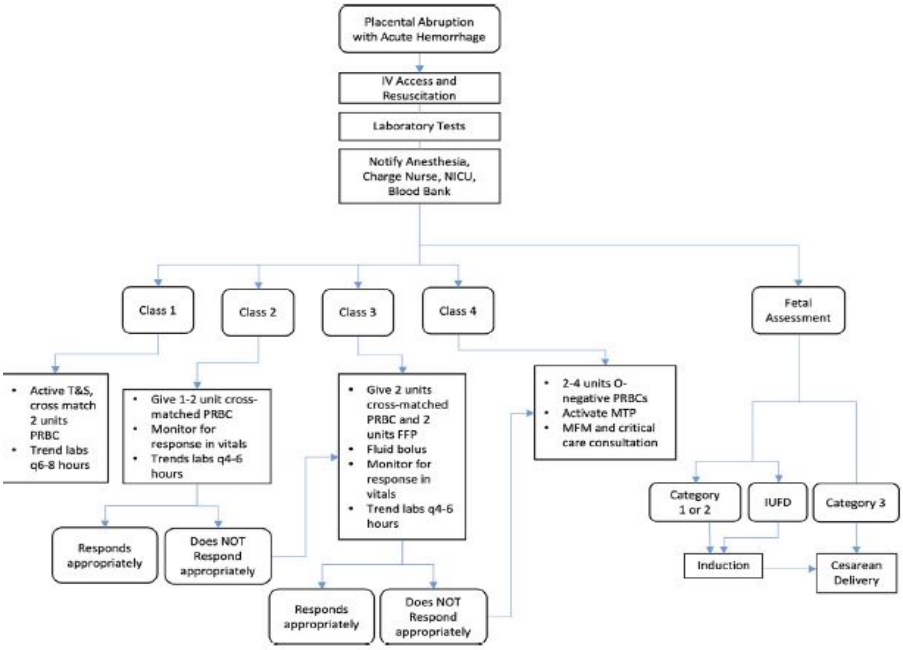

Figure 3 Algorithm in placental abruption

wall because of coagulation and thrombosis processes. Comprehensive treatment is necessary to protect the safety of both the mother and the fetus in cases of placental abruption, which is a medical emergency. Monitoring the mother's vital signs and the fetus's well-being by cardiotocography is a vital part of management since it guides the necessary activities to be performed. [1]

Stabilizing the mother's and the fetus' vital signs is the main objective of managing placental abruption. Before emergency surgery, the mother's condition must be stabilized with fluids and, if required, blood therapy. The best method for determining the onset of placental abruption involves a physical examination, which includes uterine palpation, assessing tenderness and consistency, and monitoring uterine contractions. While imaging studies to locate the abruption can be useful, they are not mandatory. Evaluating fetal well-being can be assessed by observing fetal movements, monitoring the fetal heart rate, and using cardiotocography to determine the relationship between the mother's and fetus's conditions. Signs of hypoxia may include decelerations and bradycardia.[11]

Preterm birth might lead to complications such as respiratory distress, asphyxia, and aspiration, paticularly in fetuses affected by placental abruption. It is crucial to immediately prepare the Neonatal Intensive Care Unit (NICU) for the newborn's treatment. In cases of placental abruption, 10% of babies may experience fetal death in the womb, and 35.6% may suffer from neonatal pneumonia or respiratory distress.[12]

Conclusion

Placental abruption is a serious emergency that can affect both the mother and the newborn. It can be triggered by various factors, including infections and inflammatory processes that occur with preterm premature rupture of membranes. Monitoring the mother's vital signs and assessing fetal well-being are crucial for effective management in such cases.

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