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2 **Pregnancy-related thrombotic microangiopathies: clinical** 3 **characteristics, management and maternal outcomes in an** 4 **obstetric intensive care unit**

5

6 **Introduction**

7 Pregnancy-related thrombotic microangiopathies (TMA) represent a group of severe obstetric
8 disorders characterized by microvascular thrombosis associated with mechanical hemolytic
9 anemia and thrombocytopenia.

10 The main pregnancy-associated TMAs include:

- 11 • HELLP syndrome
- 12 • atypical hemolytic uremic syndrome (aHUS)
- 13 • thrombotic thrombocytopenic purpura (TTP)
- 14 • acute fatty liver of pregnancy (AFLP)

15 These conditions share overlapping clinical features and can lead to multiorgan dysfunction
16 involving the liver, kidneys, brain and coagulation system.

17 HELLP syndrome is considered a severe form of preeclampsia and occurs in
18 approximately **0.5–1% of pregnancies**. In contrast, aHUS, TTP and AFLP are much rarer but
19 potentially life-threatening.

20 Despite advances in obstetric and intensive care management, these conditions remain
21 associated with significant maternal morbidity and mortality.

22 The aim of this study was to **describe the epidemiological characteristics, clinical**
23 **presentation, biological abnormalities, management and maternal outcomes of**
24 **pregnancy-related microangiopathies admitted to an obstetric intensive care unit.**

25

26 **Methods**

27 **Study design**

28 Retrospective descriptive study.

29 **Study setting**

30 Obstetric intensive care unit
31 Lalla Meryem Hospital
32 Ibn Rochd University Hospital Center
33 Casablanca, Morocco.

34 **Study period**

35 January 2023 – July 2025.

36 **Study population**

37 A total of **103 patients admitted for pregnancy-related microangiopathies** were included.

38 **Diagnostic distribution**

Diagnosis	Cases
HELLP syndrome	82
Acute fatty liver of pregnancy	9
Atypical hemolytic uremic syndrome	7
Thrombotic thrombocytopenic purpura	5

39 **Data collection**

40 Data were collected from medical records and included:

- 41 • epidemiological characteristics
- 42 • obstetric history
- 43 • clinical presentation
- 44 • biological findings
- 45 • imaging findings
- 46 • therapeutic management
- 47 • maternal outcomes

48 **Statistical analysis**

49 Data were analyzed using descriptive statistics.

50 Continuous variables were expressed as mean with ranges.

51 Categorical variables were expressed as percentages.

52

53 **Results**

54 **Epidemiological characteristics**

55 The mean maternal age was **31.44 years (17–47)**.

56 **Obstetric history**

- 57 • Primigravida: **33 patients (32%)**
- 58 • Multigravida: **70 patients (68%)**

59 Previous medical history included:

- 60 • gestational hypertension: **15.53%**
- 61 • gestational diabetes: **6.8%**

62 Previous miscarriage occurred in **5 patients** and intrauterine fetal death in **10 patients**.

63 **Pregnancy characteristics**

64 Microangiopathy occurred:

- 65 • **Prepartum:** 92.23%
- 66 • **Postpartum:** 7.77%

67 Mean gestational age: **31 weeks + 5 days**
68 (range 19–41 weeks)

69 **Type of pregnancy**

- 70 • Singleton pregnancy: **92.23%**
- 71 • Twin pregnancy: **7.77%**

72 **Prenatal follow-up**

- 73 • Followed pregnancy: **81 patients**
- 74 • No prenatal follow-up: **22 patients**

75

76 **Clinical findings**

77 The most frequent symptoms were:

Symptom	Percentage
Headache	70.87%
Visual disturbances	48.54%
Tinnitus	48.54%
Asthenia	43.68%
Right hypochondrial pain	36.89%
Nausea	28.15%

Symptom	Percentage
Vomiting	20.38%
Jaundice	14.56%

78 Hypertension was present in **83.5% of patients**.

79 Proteinuria $\geq 2+$ was detected in **68% of cases**.

80

81 **Biological findings**

82 Mean laboratory parameters were:

Parameter	Mean value
ASAT	426.85 UI/L
ALAT	290.59 UI/L
Hemoglobin	11.12 g/dL
Platelets	90,689/mm ³
Creatinine	15.6 mg/L
Urea	0.56 g/L

83 Hyperleukocytosis was observed in **75% of patients**.

84 Thrombocytopenia occurred in **90% of cases**, consistent with microangiopathic thrombosis.

85 Cytolysis was observed in **95% of cases**.

86

87 **Imaging findings**

88 **Obstetric ultrasound**

89 Performed in all patients.

90 Findings included:

- 91 • intrauterine growth restriction: **19 cases**
- 92 • retroplacental hematoma: **12 cases**
- 93 • intrauterine fetal death: **9 cases**

94 **Abdominal ultrasound**

95 Performed in **30 patients**.

- 96 Findings included:
- 97 • ascites
 - 98 • hepatic subcapsular hematoma
 - 99 • hepatic abnormalities
 - 100 • renal abnormalities

101 **CT scan**

102 Performed in **16 patients**.

103 Findings included:

- 104 • bilateral pneumonia
- 105 • pleural effusion
- 106 • hepatic ischemic lesions
- 107 • hemoperitoneum

108 One patient presented imaging compatible with **posterior reversible encephalopathy**
109 **syndrome (PRES)**.

110

111 **Therapeutic management**

112 Management included **obstetric treatment and intensive care support**.

113 **Mode of delivery**

- 114 • Cesarean section: **86.41%**
- 115 • Vaginal delivery: **13.59%**

116 **Intensive care treatment**

- 117 • Mechanical ventilation: **4.85%**
- 118 • Albumin infusion: **7.8%**

119 **Blood transfusion**

- 120 • Red blood cells: **22.5%**
- 121 • Platelets: **19.43%**
- 122 • Fresh frozen plasma: **4.7%**

123 **Medical therapy**

- 124 • Antihypertensive treatment: **100%**
- 125 • Corticosteroids: **76.7%**
- 126 • Magnesium sulfate: **62.14%**

127 • Antibiotics: **58.25%**

128 Mean ICU stay was **5 days (1–23 days)**.

129

130 **Maternal outcomes**

131 **Complications**

132 The most frequent complication was **acute kidney injury (14.56%)**.

133 Among these patients:

134 • **4.85% required hemodialysis**

135 Other complications included:

- 136 • disseminated intravascular coagulation
- 137 • neurological complications
- 138 • acute respiratory distress syndrome
- 139 • pulmonary embolism
- 140 • pancreatitis

141 Ascites occurred in **11.65%**, pulmonary edema in **5%**, and fever in **8%**.

142 **Maternal mortality**

143 Six maternal deaths occurred, corresponding to a **maternal mortality rate of 6.18%**.

144

145 **Discussion**

146 Pregnancy-related thrombotic microangiopathies represent severe obstetric conditions
147 characterized by endothelial dysfunction and microvascular thrombosis leading to multiorgan
148 involvement.

149 HELLP syndrome remains the most common form, accounting for nearly 80% of cases in our
150 series, consistent with previous reports.

151 The mean maternal age in our study was **31.44 years**, comparable to international studies
152 reporting a mean age between **26 and 35 years**.

153 The mean gestational age at diagnosis was **31 weeks**, consistent with literature indicating that
154 most cases occur during the **third trimester**.

155 Hypertension was present in **83.5% of patients**, similar to the **80–90% prevalence reported**
156 **in HELLP syndrome.**

157 Biological abnormalities such as thrombocytopenia and cytolysis were consistent with the
158 pathophysiology of thrombotic microangiopathy.

159 Acute kidney injury was the most frequent complication observed in our cohort, reflecting the
160 renal vulnerability in severe microangiopathies.

161 The maternal mortality rate of **6.18%** reflects the severity of these conditions and remains
162 comparable to rates reported in intensive care cohorts.

163 Early diagnosis and multidisciplinary management involving obstetricians, intensivists,
164 nephrologists and hematologists are essential to improve maternal outcomes.

165

166 Conclusion

167 Pregnancy-related thrombotic microangiopathies are severe obstetric emergencies requiring
168 early diagnosis and intensive multidisciplinary management.

169 HELLP syndrome is the most frequent entity, and acute kidney injury represents the most
170 common complication.

171 Prompt recognition and optimal intensive care management are crucial to improve maternal
172 prognosis.

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