Study of pregnancy with disseminated intravascular coagulation

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Received: 26 August 2021
Revised: 04 October 2021
Accepted: 05 October 2021

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ABSTRACT

Background: At present time, obstetric bleeding remains to be the world’s main cause of maternal mortality, early identification of factors leading to haemorrhage and early management of underlying pathological process is the key stone of the treatment. The most important pregnancy related condition leading to bleeding with high maternal mortality and morbidity rate is disseminated intravascular coagulation (DIC).

Methods: A prospective study of 50 cases of pregnancy with DIC was performed from May 2018 to November 2020 in our institute to detect the various aetiology and complications associated with DIC leading to maternal mortality and morbidity and study perinatal outcome in pregnant women with DIC.

Results: The prevalence of DIC in our institute is 0.22%. Common causes of DIC were abruption (36%), haemorrhage (34%), preeclampsia (18%), sepsis (6%) and acute hepatic failure (6%). The composite severe maternal morbidity outcome in haemorrhage (100%), abruption (63%), preeclampsia (58%), and AVH (33%). Out of the three most common causes (abruption, haemorrhage and preeclampsia), the composite maternal morbidity outcome was significantly more in women with haemorrhage than with abortion and preeclampsia.

Conclusions: DIC, as a marker of severe obstetrical complications, is associated with high levels of mortality and morbidity. Recognition of the antecedent causes and early investigation for and active management of DIC may help lower this morbidity.

Keywords: Disseminated intravascular coagulation in pregnancy, Maternal morbidity and mortality

INTRODUCTION

At present time, obstetric bleeding remain to be the world’s main cause of maternal mortality, early identification of factors leading to haemorrhage and early management of underlying pathological process is the key stone of the treatment. The most important pregnancy related condition leading to bleeding with high maternal mortality and morbidity rate is disseminated intravascular coagulation.¹⁻³

The danger surroundings obstetrical disseminated intravascular coagulation were recognized and described as early as 1901 by Joseph DeLee, in a fatal case of haemorrhagic diathesis with placental abruption.⁴ As per definition of International society of Thrombosis and Haemostasis, DIC is defined as: An acquired syndrome characterised by intravascular activation of coagulation with loss of localization arising from different causes.⁵⁻⁶

It can originate from and cause damage to the microvasculature, which is sufficiently severe to produce organ dysfunction. DIC is estimated to be present in as many as 1% of hospitalised patients. DIC is always secondary phenomenon and ranging from obstetrical accidents to malignancy.⁶

Obstetrical condition associated with DIC include Abruption, placenta previa, severe preeclampsia/eclampsia, HELLP syndrome, PPH, retained dead fetus, delayed miscarriage, septicemia, amniotic fluid embolism, and acute fatty liver of pregnancy.⁷⁻⁹
The pathophysiology of DIC involved a systemic activation of coagulation followed by widespread fibrin deposition, microvascular thrombosis and organ failure. Clinically, DIC can present anywhere along the spectrum from thrombosis and micro vascular damage to overt and uncontrolled bleeding. By identifying antecedents associated with obstetrics DIC clinicians may be better prepared to diagnose and initiate early management of this life threatening condition.

DIC was reported to be the second most common severe maternal morbidity indicator. It was associated with nearly 1/4th of maternal death. Study done by Cunningham in 2015 causes for DIC were abruption 1:200, AFE 2:10000, acute fatty liver of pregnancy 1:10000, massive obstetric haemorrhage 23 to 30:1000 and sepsis. Complications with DIC are bleeding, shock, acute renal failure, pleural effusion, pulmonary oedema, haematuria, hepatic encephalopathy, cardiac arrest, hypoxic brain damage etc.

Here we performed a prospective study of 50 cases of pregnancy with DIC from May 2018 to November 2020 in our institute to detect the various aetiology and complications associated with DIC leading to maternal mortality and morbidity and study perinatal outcome in pregnant women with DIC.

Aims and objectives

To study the prevalence of DIC in our institute and know aetiology and contributing factors responsible for DIC. To study maternal and perinatal morbidity and mortality.

METHODS

It was a prospective cross sectional study conducted at Smt. SCL Hospital, Ahmedabad, Gujarat, India for a period of May 2018 to November 2020.

Inclusion criteria

Indoor pregnant women suffering from DIC admitted in Smt. SCL Hospital.

Exclusion criteria

Pregnant women with bleeding or coagulative disorders.

Procedure

The total number of antenatal indoor patient during this period was 23014. Out of which approximately 50 cases of DIC were diagnosed. Demographics of the affected woman collected including age, parity, education, socioeconomical status, address, gestational age at delivery, mode of delivery, days in hospital and maternal weight. The laboratory tests include routine test (complete blood count, blood group, blood sugar, urine routine microscopy and HIV/HBsAg status), DIC specific test are platelet count, PTINR, aPTT, PTINR/aPTT, serum fibrinogen, BTCT, FDP and D dimer. The presence of overt DIC was determining by using ISTH DIC scoring system, which assigns points on the basis of decreasing platelet count, prolonged prothrombin time, elevated fibrin related marker and fibrinogen level.

International society for Thrombosis and Haemostasis (ISTH) disseminated intravascular coagulation scoring system used only in patient with underlying condition known to be associated with DIC. Overt DIC >5 points, non-overt DIC <5 points.

Table 1: ISTH DIC scoring system.

|                | 0                          | 1                          | 2                          |
|----------------|----------------------------|----------------------------|----------------------------|
| Thrombocytopenia | >100,000/mm³               | ≤100,000/mm³               | ≤50,000/mm³                |
| D-dimer        | Normal                     | ≤10 times ULN              | ≥10 times ULN              |
| PT prolongation | <3 seconds                 | 3-6 seconds                | 6 seconds                  |
| Fibrinogen     | >100 mg/dl                 | ≤100 mg/dl                 |

Ethical approval was taken from the institutional ethics committee.

Statistical analysis

Data was analysed using Microsoft excel.

RESULTS

The prevalence of DIC in our institute was 0.22%. In present study, 18 (36%) were booked and 32 (64%) were emergency patients, incidence of DIC was higher in emergency patients. Maximum numbers of patients were found between the ages of 20 to 30 years (84%) which is the reproductive age group. DIC was developed in 1 (02%) antenatal and 49 (98%) postnatal patient. Common causes of DIC were abruption (36%), haemorrhage (34%), preeclampsia (18%), sepsis (6%) and acute hepatic failure (6%). Out of 49 patients, 13 (26%) were delivered vaginally and 36 (74%) undergone for caesarean section. In vaginal delivery DIC is mostly due to atonic PPH and septicaemia, while in caesarean section DIC due to...
abruption, placenta previa and intrapartum haemorrhage. Most common indications of caesarean were abruption, placenta previa and severe preeclampsia/eclampsia. In all these cases caesarean was mandatory.

Table 2: DIC antecedents and maternal outcome in present study.

| Antecedents         | Abrupted (18) | Haemorrhage (17) | Preeclampsia (9) | AHF (3) | Sepsis (3) | Total (50) |
|---------------------|---------------|------------------|------------------|---------|------------|------------|
| Cesarean section    | 15            | 12               | 07               | 02      | 00         | 36 (73%)   |
| Vaginal delivery    | 02            | 03               | 02               | 01      | 00         | 13 (26%)   |
| Massive transfusion | 09            | 10               | 01               | 01      | 00         | 21 (42%)   |
| Hystectomy          | 00            | 09               | 00               | 00      | 00         | 09 (18%)   |
| ICU admission       | 04            | 05               | 05               | 02      | 03         | 22 (44%)   |
| Dialysis            | 01            | 01               | 01               | 01      | 00         | 04 (8%)    |
| Maternal death      | 00            | 04               | 03               | 00      | 01         | 08 (16%)   |
| Composite outcome   | 12 (63%)      | 18 (100%)        | 04 (58%)         | 01 (33%) | 00 (00%)  | 30 (60%)   |

Table 3: Mode of treatment in DIC.

| Causes                        | Abrupted (18) | Haemorrhage (17) | Preeclampsia (9) | AHF (3) | Sepsis (3) | Total (50) |
|-------------------------------|---------------|------------------|------------------|---------|------------|------------|
| Medical management            |               |                  |                  |         |            |            |
| Oxytocin                      | 18            | 17               | 09               | 03      | 03         | 33 (100%)  |
| Misoprostol                   | 09            | 11               | 03               | 01      | 00         | 24 (48%)   |
| Ergometrine                   | 02            | 04               | 02               | 01      | 00         | 06 (18%)   |
| 15 methyl prostaglinds        | 05            | 07               | 05               | 00      | 00         | 17 (34%)   |
| Inotropic support             | 05            | 08               | 03               | 02      | 02         | 20 (40%)   |
| Antibiotics                   | 18            | 17               | 9                | 3       | 3          | 50 (100%)  |
| Surgical management           |               |                  |                  |         |            |            |
| Hysterectomy                  | 00            | 09               | 00               | 00      | 00         | 09 (18%)   |
| Uterine tamponade             | 02            | 03               | 01               | 00      | 00         | 06 (12%)   |
| Uterine compression sutures   | 03            | 02               | 00               | 00      | 00         | 5 (10%)    |
| Major vessel ligation         | 01            | 02               | 00               | 00      | 00         | 03 (6%)    |
| Embolization                  | 00            | 00               | 00               | 00      | 00         | 00 (00%)   |
| Blood products                |               |                  |                  |         |            |            |
| Blood                         | 70            | 74               | 20               | 08      | 05         | 177        |
| Fresh frozen plasma           | 72            | 90               | 32               | 24      | 00         | 218        |
| Cryoprecipitate               | 12            | 16               | 08               | 00      | 00         | 36         |
| Platelets                     | 108           | 81               | 36               | 08      | 00         | 233        |
| Albumin                       | 00            | 01               | 00               | 01      | 00         | 02         |

Table 4: DIC antecedents and perinatal outcome in present study.

| Antecedents       | Abrupted (18) | Haemorrhage (19) | Preeclampsia (9) | AHF (3) | Sepsis (2) | Total (51) |
|-------------------|---------------|------------------|------------------|---------|------------|------------|
| Infant survived   | 09            | 19               | 07               | 03      | 03         | 39 (76%)   |
| Neonatal death    | 00            | 04               | 02               | 01      | 00         | 07 (18%)   |
| Intrauterine death| 11            | 00               | 01               | 00      | 00         | 12 (24%)   |
| Nicu admission    | 05            | 08               | 05               | 02      | 01         | 21 (42%)   |
| Nbw               | 10            | 12               | 06               | 02      | 02         | 32 (54%)   |
| Lbw               | 06            | 06               | 02               | 01      | 00         | 15 (29%)   |
| Vlbw              | 02            | 01               | 01               | 00      | 00         | 04 (8%)    |

The DIC severity score (by ISTH DIC scoring system) for each cause were calculated and categorised into non overt and overt DIC. Percentage of non-overt DIC was 66% and overt DIC was 34%. Maternal outcome was worst in overt DIC. There was no statistical difference between the severity of DIC and obstetrical causes in our study.14

In present study, caesarean section done in 36 (73%) and vaginal delivery in 13 (26%) patients, ICU admission
required in 22 (44%) patients, massive blood transfusion was given in 21 (42%) patients, hysterectomy done in 8 (16%) patients and dialysis in 4 (8%) patients. Need of massive blood transfusion is higher in haemorrhage (85%) and abruption (56%) compared to other causes.

Total 9 (18%) hysterectomy were performed, 7 (78%) due to intrapartum haemorrhage and 2 (22%) rupture uterus, 4 (8%) dialysis required in cases of acute renal failure.

Medical treatment, surgical treatment and blood product replacement were used in majority of cases which is outlined in the Table 3.

Medical treatment is given in form of uterotonics (oxytocin (100%), misoprostol (48%), ergometrine (18%) and prostaglandins (34%)), antibiotics (100%) and inotropic support (40%).

Surgical management include hysterectomy (18%), uterine tamponade (12%), uterine compression sutures (10%), major vessel ligation (06%).

Almost all the patients were given blood and blood products. Rate of blood and blood products transfusion were highest in haemorrhage followed by abruption.

(Total number of blood 177 unit and blood products 487 units were given in 50 patients so on an average 3.5 blood unit in one patient was required).

There were two twin pregnancy and total 51 infants were born by 49 mothers out of whom 37 (70%) infants survived, 13 (25%) died in utero. 21 (53%) required NICU admission.

Out of 39 neonates, 7 (18%) neonates were died. Common causes of mortality were prematurity, LBW and septicaemia, 32 (54%) having normal birth weight, 15 (29%) having low birth weight and 04 (8%) having very low birth weight.

In our study, total 8 maternal deaths occur with case fatality of 16% which means out of 6 patients 1 was prone to death. Out of 8, only 2 (20%) were booked patient and 6 (80%) were emergency patients. Case fatality rate was higher in emergency patient (10%) compared to booked patient (6%) suggesting that lack of antenatal care affect maternal outcome. Most common cause of death was haemorrhage (50%).

**DISCUSSION**

Prevalence of DIC in our institute during study period from May 2018 to November 2020 was 0.22%. Because of many definitions and variable degree of severity accurate incidence of DIC is not known but it ranges from 0.03% to 0.35%.
Our study compared with study done by Rattray et al. Major causes of DIC in present study abruption (36%), haemorrhage (34%), preeclampsia (18%), sepsis (6%), acute hepatic failure (6%). Here haemorrhage includes blood loss due to placenta previa, uterine atonicity or genital tract trauma. No case of AFE found in my study. In study done by Rattray et al of DIC were abruption (37%), PPH (29%), preeclampsia (14%), sepsis (6%), AVH (8%), which was matched with our study. In present study, caesarean section done in 36 (73%) and vaginal delivery in 13 (26%) patients, ICU admission required in 22 (44%) patients, massive blood transfusion was given in 21 (42%) patients, hysterectomy done in 8 (16%) patients and dialysis in 4 (8%) patients which was well compared with study done by Rattray et al in which caesarean done in 22 (44%) and vaginal delivery in 27 (66%) patients, ICU admission required in 20 (41%) patients massive blood transfusion was given in 29 (59%), hysterectomy done in 9 (18%) patients and dialysis in 3 (6%) patients. Need of massive blood transfusion is higher in haemorrhage (85%) and abortion (56%) compared to other cause. There was total 9 (18%) hysterectomy were performed, 7 (78%) due to intrapartum haemorrhage and 2 (22%) rupture uterus. The composite severe maternal morbidity outcome in haemorrhage (100%), abortion (63%), preeclampsia (58%), and AVH (33%) (composite severe maternal morbidity outcome calculated on the basis of one or more of hysterectomy, ICU admission, blood transfusion >5 unit and ATN requiring dialysis). Out of the three most common causes (abruption, haemorrhage and preeclampsia), the composite maternal morbidity outcome was significantly more in women with haemorrhage than with abortion and preeclampsia.

There were two twin pregnancy and total 51 infants were born by 49 mothers out of whom 37 (70%) infants were survived, 13 (25%) were died in utero. Study by Rattray et al, there were four twin pregnancy and total 53 infants were born by 49 mothers out of whom 39 (75%) were emergency booked patient and 5 (7%) were emergency booked patients. Causes of death were haemorrhage (50%), severe preeclampsia/eclampsia (25%) and septicaemia (25%) in my study indicating the blood loss remain leading cause of maternal morbidity and mortality.

The perinatal mortality rate was 38%, stillbirth rate 24% and neonatal death rate 17%. Placental abruption was associated with the worst perinatal outcome, with 11 of 18 (61.1%) infants stillborn.

Limitations of the study are present study was a single centric study having a small sample size. So the results may not be reflected in the whole country.

CONCLUSION
DIC, as a marker of severe obstetrical complications, is associated with high levels of mortality and morbidity. Recognition of the antecedent causes and early investigation for and active management of DIC may help lower this morbidity. Despite its rarity, systematically searching for DIC should be added in treatment algorithms in the management of known obstetrical antecedents, because treatment delay may significantly worsen the prognosis. We should emphasize the low socioeconomic class and illiterate group for regular ANC and awareness about health care facilities to minimize the antecedent factors and complications of DIC. A timely referral to a physician or a haematologist will help sort out many of these adverse events and improve maternal outcome. For patients who are in less than tertiary care, a prompt transfer to a higher institution that has better facilities of specialist and blood bank could save lives. In particular the prompt management and arrest of postpartum haemorrhage before the need of massive transfusion and its attendant coagulopathy is one of the lessons from this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kadikar SK, Divan FJ, Topiwala U, Agasiwala S. Study of pregnancy with disseminated intravascular coagulation. Int J Reprod Contracept Obstet Gynecol 2021;10:4220-5.