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RESEARCH ARTICLE

Clinical study of disseminated intravascular coagulation in pregnancy at tertiary care centre - risk factors, complications, management and outcome

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ABSTRACT

Objectives: 1) To estimate the frequency of DIC in pregnant women admitted in Vanivilas hospital, 2) To describe the risk factors of DIC, 3) To describe the maternal and perinatal outcome. **Methods**: This is a prospective study conducted at Vanivilas Hospital, Bangalore, Karnataka, from January 2019 to June 2020 for 18 months. After applying inclusion criteria and DIC scoring from ISTH, 96 women who were diagnosed with overt DIC were studied with respect to their age, parity, presenting symptoms, associated obstetric complications, mode of delivery, number of transfusions, development of complications and maternal and perinatal outcome. **Results**: There were 23476 deliveries and 96 (1 in 245 deliveries) cases of overt DIC during 18 months period. Among associated obstetric complications, 40.6% had abruptio placenta, 26% pregnancy induced hypertension, 14.6% postpartum haemorrhage, 6.3% IUD, 5.2% HELLP syndrome, 4.2% AFLP and 3.2% suspected embolism. The complications of DIC noted were haemorrhage 75%, hypovolemic shock 40.6%, acute kidney injury 18.8%, MODS 37.5%, sepsis 18.6% and maternal deaths 12.5%. All 96(100%) women were admitted to ICU and all received blood component transfusions. 30.2% required mechanical ventilation, 18.8% ionotrope support, 16.7% dialysis, and 13.5% underwent peripartum hysterectomy and 11.5% stepwise devascularisation. 33.3% neonates required NICU admission and 27.1% were preterm births. **Conclusion**: DIC was seen in 1 in 245 deliveries. Abruption was the commonest risk factor for DIC. Obstetric haemorrhage was the main complication. The maternal mortality associated with DIC was 12.5%.

Keywords: Pregnancy, DIC, abruption placenta.

Disseminated intravascular coagulation (DIC) is a pathologic disruption of the finely balanced process of haemostasis. In DIC there is widespread activation of intravascular coagulation mechanism leading to the deposition of fibrin clots in the blood vessels and circulation. This results in consumption of clotting factors which leads to bleeding diathesis leading to haemorrhage.[1] Pregnancy is a hypercoaguable state. During the process of parturition and the postpartum period, substantial activation of the coagulation cascade and generation of thrombin results from the release of tissue factor to the maternal circulation following the separation of the membranes and the placenta [2] which may start the process of intravascular coagulation cascade and DIC.

As early as in 1901 De Lee reported "temporary haemophilia" developed in a woman with a placental abruption and another with a long – dead macerated fetus [3]. Observations that extensive placental abruption as well as other accidents of pregnancy, were frequently associated with hypofibrinogenemia stimulated interest in causes of intense intravascular coagulation [4]. In some women with amniotic fluid embolism, DIC appears to be the "Forme Fruste" of amniotic fluid embolism [3, 5]. Management includes removal of the underlying insult/disorder or the

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initiating stimulus, to manage circulating blood volume and to replace clotting factors and red blood cells [4].

Consumptive coagulopathy is almost always seen as a complication of an identifiable, underlying pathological process against which treatment must be directed to reverse defibrination [5]. A failure to anticipate or detect the early stages of DIC is cited as a major deficiency in the care of women who die from obstetric haemorrhage and despite advances in obstetric care and haematological services, haemorrhage with associated DIC remains a major cause of maternal morbidity and death [6, 7]. This study is done with the intention of early detection of the factors leading to development of DIC and in turn early interventions to improve maternal outcome.

This study is undertaken with the objectives of - 1) To estimate frequency of DIC in pregnant women in Vanivilas hospital, 2) To describe the risk factors of DIC, 3) To describe the maternal and perinatal outcome.

Materials and methods

This is a prospective study conducted at Vanivilas Hospital which is a tertiary care centre in Bangalore, Karnataka, India, attached to Bangalore Medical College and Research Institute from January 2019 to June 2020 for 18 months.

All pregnant women admitted to our hospital with DIC at admission or who have developed DIC during their stay in hospital were included in the study. Those women who develop/fulfil following criteria on admission or during their stay in the hospital irrespective of gestational age and pregnancy outcome were included. The inclusion criteria were women -

- With symptoms and signs of bleeding from three unrelated sites – ear, nose, throat, gastrointestinal tract, respiratory tract, site of venepuncture or IV infusion, bleeding from operative site or postpartum haemorrhage.
- Petechiae, purpura, haemorrhagic bullae, skin necrosis of lower limbs (purpura fulminans).
- Laboratory information like low platelet counts (<100000/mm^3), elevated prothrombin time (PT >3sec), elevated fibrin markers (D- dimmers and fibrin degradation products), low fibrinogen level (<100mg/dl).

Data collected from women and their case records such as demographic details, parity, gestational age and clinical features at presentation, detailed history of current pregnancy and previous pregnancies, associated complications during antenatal, intrapartum and postpartum period were noted down. Details of investigations like bleeding time (BT), clotting time (CT), clot retraction time (CRT), coagulation profile, serum fibrinogen levels, fibrin degradation products (FDPs) are noted from hospital records. After obtaining the data they were assigned scores as per pregnancy modified International society on Thrombosis and Haemostasis (ISTH) DIC scoring system [8,9] which is as follows-

Table 1: Modified International society on Thrombosis and Haemostasis (ISTH) DIC scoring system

Parameter	Pregnancy modified ISTH DIC scoring
Platelet count (/mm^3)	
>1,85,000	0
>1,00,000	1
50,000-100000	2
<50000	1
Prothrombin time difference (between the case and control)	
>1.5	25
1 – 1.5	12
0.5 – 1	5
<0.5	0
Fibrinogen level (mg/l)	
</= 3	25
3 – 4	6
4 – 4.5	1
>4.5	0

A total score of 26 and higher is considered as overt DIC and included in our study. Duration of hospitalization, need for blood and blood products transfusion, period of gestation at delivery/abortion, mode of delivery, need for any surgical intervention, ICU admission and mortality rates were noted down. Women were followed up throughout the period of their hospitalization till discharge.

Results

A total of 96 patients studied during the period. Following data obtained-there were 23476 deliveries during the same period. So the incidence of overt DIC was 1 per 245 deliveries.

Out of 96 women, 4 (4.2%) were 19 or less than 19 years of age, 39 (40.6%) were between 20-25 years, 42 (43.8%) were between 26-30 years, 8 (8.3%) between 31-35 years and 3 (3.1%) were above 36 years of age. There were 26 (27%) primigravidas, 53 (55.3%) second gravidas, 13(13.5%) third gravidas and 4(4.2%) women with obstetric score of gravid 4 and above in this study. Gestational age at admission was 28-32 weeks in 7 (7.3%) women, 32-37 weeks in 22 (22.9%) and 37weeks and above in 67 (69.8%) women. During our study period none developed DIC before 28 weeks of gestational age.

49 (51.1%) women presented with history of bleeding per vagina, 24 (25%) with high blood pressure and convulsions, 16 (16.7%) with of placenta previa, 3 (3.1%) with yellowish discolouration of eyes, 1(1%) with post LSCS (lower segment caesarean section) with adherent placenta and

bleeding and 3(3.1%) with postpartum haemorrhage following delivery.

Table 2: Associated obstetric conditions

Associated obstetric conditions	Number	Percentage
Abruptio placenta	39	40.6
Pregnancy induced hypertension	25	26.0
Postpartum haemorrhage	14	14.6
Retained placenta	1	1.0
Intrauterine fetal demise	6	6.3
HELLP syndrome	5	5.2
AFLP	4	4.2
Pulmonary embolism	3	3.1

HELLP – Haemolysis, elevated liver enzymes and low platelet count syndrome; AFLP – Acute fatty liver of pregnancy

Associated obstetric conditions which have lead to the development of disseminated intravascular coagulation are shown in table 2, where abruptio placenta is the major associated condition.

Table 3: Complications of DIC

Complications	Number	Percentage
Obstetric Haemorrhage	92	95.8
Hypovolemic shock	39	40.6
Acute kidney injury	18	18.8
Multiorgan dysfunction	36	37.5
Sepsis	18	18.6
Maternal death	12	12.5
Intracranial haemorrhage	1	1

55 (57.3%) delivered by caesarean and 41(42.7%) delivered vaginally. Among 55 cesarean deliveries, 1 case was operated outside and referred with bleeding with adherent placenta, which underwent peripartum hysterectomy in our centre and among vaginal deliveries 3 were delivered outside and referred with history of PPH (postpartum haemorrhage) following delivery.

Table 4: ICU admission and interventions

Interventions	Number	%
ICU admission	96	100
Dialysis	16	16.7
Peripartum hysterectomy	13	13.5
Stepwise devascularisation	11	11.5
Exploration under anesthesia and cervical tear repair	01	1
Ionotrope support	18	18.8
Mechanical ventilation	29	30.2

8 (8.3%) women presented with DIC in the antenatal period, 43 (44.8%) presented with DIC during intrapartum period and 45 (46.9%) women presented with DIC after the delivery.

Complications following disseminated intravascular coagulation are listed in table number 3. Among women with multiorgan involvement, 17 (17.7%) developed respiratory distress, 15 (15.6%) had liver injury and 4 (4.2%) developed hypoxic encephalopathy.

All patients received multiple blood component transfusions. 63 (65.6%) of them received more than 10 transfusions within 24 hours of recognition of DIC. 72 (75%) of them received 15 and more units of component therapy during their stay in the hospital. Total of 384 units of packed red blood cells (PRBC) transfused with an average of 4 units per woman. Total of 516 units of fresh frozen plasma (FFP) transfused with an average of 5.38 per woman. 454 units of platelet concentrate transfusion with an average of 4.73 per woman. Total cryoprecipitate transfused were 126 units. Table 4 shows the interventions carried out in the institution in addition to blood and blood product transfusion.

12(12.5%) women died of DIC which accounts to 0.05% of total deliveries. Among them 4 died of irreversible hypovolemic shock, 2 due to hypoxic encephalopathy, 2 due to sepsis and 4 due to multiorgan failure. Perinatal outcome is shown in table 5.

Table 5: Perinatal outcome

Perinatal outcome	Number	Percentage
Normal	50	52.1
NICU admission	32	33.3
Prematurity	26	27.1
Birth asphyxia	16	16.7
Neonatal mortality	20	20.8
Intrapartum stillbirth	6	6.2
IUD	6	6.2

NICU – Neonatal intensive care unit, IUD – Intrauterine death

Duration of hospitalisation was <48 hours in 6 (6.3%) women as all 6 of them died during the stay in the hospital, 10 (10.4%) of them duration of hospitalisation was between 2 to 10 days, 72(75%) of them it was up to 15 days and 8(8.3%) women it was more than 15 days. The mean hospital stay was 9.8 days.

Discussion

This is one of the largest studies about overt DIC in pregnancy where 96 women were studied from a single centre. The frequency of DIC during the study period was 1 in 245 deliveries. This is high compared with a study conducted by Ounjai Kor-anantaku[10] where the frequency was 1 per 1,355. In present study, majority of women were in 26-30 years age group which is 43.8% followed by 20-25 years age group which is 40.6%, together contributing to 84.4% of the cases. More than half of the women (55.3%) in present study were second gravidas and 69.8% women presented with DIC features were beyond 37 weeks of gestational age.

In present study majority of them presented with bleeding per vagina (51.1%) followed by high blood pressure (25%). We could not find any other studies to compare these observations.

Among the associated obstetric conditions that led to the development of DIC, 40.6% had abruptio placenta which is higher than seen in a study conducted by Ounjai Kor-anantaku [10] where it is 24% and in M Yang and colleagues[11]

study it is 26.92%. 26% had hypertensive disorders of pregnancy which is comparable to the study by Ounjai Kor-anantaku [10] where it is seen in 20%. 14.6% developed DIC following PPH which is comparable to a study by M Yang[11] and colleagues (15.4%) and lesser than that reported by Sohn [12] (22.4%). AFLP contributed to 4.2% cases which is lesser compared to the study by Ounjai Kor-anantaku [10] (16%). Pulmonary Embolism contributed to 3.1% of cases which lesser than 16% seen in the study by Ounjai Kor-anantaku [10], 15.4% in M Yang study.

Among abruptio placenta cases, 24 (61.5%) were taken for caesarean delivery within 6 hours of diagnosis of abruption; one (2.6%) underwent caesarean hysterectomy and 4 (10.3%) stepwise devascularisaton for complete haemostasis. All 12 cases of HELLP syndrome were taken for caesarean delivery at the earliest, 2 (16.7%) of them required peripartum hysterectomy and 3 (25%) stepwise devascularisation. Out of 4 AFLP cases 2 (50%) delivered by caesarean. 8 (32%) cases of hypertensive disorders of pregnancy cases were taken for caesarean. Among postpartum haemorrhage (PPH) cases, 10 (71.4%) underwent peripartum hysterectomy and 4 (28.5%) stepwise devascularisation. Totally, 13.5% of women underwent peripartum hysterectomy and 11.5% stepwise devascularisation which is comparable to the study by Ounjai Kor-anantaku [10] where it is 26.9% and 19.2% respectively.

Management of complications - 95.8% women had obstetric haemorrhage at or after admission and 40.6% of them developed hypovolemic shock, managed with component transfusion. 18.8% of them developed acute kidney injury which required haemodialysis - 6 of them required 4 dialysis and 12 women more than 4 dialysis. 18.6% developed sepsis treated with broad spectrum parenteral antibiotics and sepsis treatment protocol, mortality seen in 2 cases.

In present study there were 12 (12.5%) maternal deaths which are similar to a study by Yang and colleagues[11] in china which is 15.4% and 24% in a study by Kor-anantakul O[10]. 52.1% had normal neonatal outcome, this is because of the early decision to deliver.

All these patients were admitted to intensive care unit (ICU), though some of them could have been managed in HDU (high dependency unit). Since there is no HDU in our hospital, we managed them in ICU.

All the pregnant women in our hospital are given treatment free of cost under Janani Shishu Suraksha Yojana. Availability of 24 hours blood bank which issues blood and blood products free of cost under the above said scheme which helped us to manage these cases without any delay or financial constraints which helped for reduced maternal mortality and better outcome in present study.

Conclusion

DIC was seen in 1 in 245 deliveries. Abruptio placenta being the main risk factor for the development of DIC followed by hypertensive disorders of pregnancy and postpartum haemorrhage. The main maternal complications were haemorrhage, hypovolemic shock, multiorgan failure, acute kidney injury and sepsis. 52.1% had normal neonatal outcome. The maternal mortality associated with DIC was 12.5%. The early initiation of appropriate treatment to reverse the coagulopathy, quick decision on surgical interventions, early transfusion of blood and blood products improved the outcome in patients with DIC.

Conflict of interest: None. **Disclaimer:** Nil.

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