ORIGINAL ARTICLE

Overt disseminated intravascular coagulation (DIC)

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ABSTRACT
BACKGROUND: Objectives: Disseminated intravascular coagulation (DIC) is characterized by systemic activation of blood coagulation, which results in generation and deposition of fibrin, leading to microvascular thrombi in various organs and contributing to multiple organ dysfunction syndromes (MODS); at the same time bleeding from other sites due to consumption of coagulation factors. In this study we aim to find out common obstetric conditions leading to DIC. We also study the average DIC score, range of DIC scores and mortalityobserved in these obstetric conditions. **Design:** A retrospective study of hospital records was done on 70 random cases of DIC defined by elevated laboratory parameters like platelet count, FDP, S. fibrinogen and PT timefrom July-2011 to October-2013 at Civil Hospital, Ahmedabad. The patients were divided in two groups: Overt DIC (DIC score ≥ 5) and non-overt DIC (DIC score < 5). **RESULTS:** Mean age of patients was 24.31 years; range being 20-36 years. Mean gravida was 2.43 ranging from 1-7.Major causes of DIC were abruption (53%) and HELLP (34%). There were 32 patients (46%) of overt DIC and 38 patients of non overt DIC.Overall mortality rate was 27% (19/70) and overt DIC mortality rate was 59% (19/32).None of the patients with non-overt DIC died.Most common cause of overt DIC was HELLP(13/32, 41%) followed by Abruption(11/32, 34%). **CONCLUSION:** Overt DIC brings high rate of mortality. Care should be taken in case of patients with HELLP and abruption to avoid overt DIC and thereby reduce the mortality rate.

Keywords: DIC score, Overt DIC, HELLP, Eclampsia.

INTRODUCTION

Disseminated intravascular coagulation (DIC) is characterized by systemic activation of blood coagulation, which results in generation and deposition of fibrin, leading to microvascular thrombi in various organs and contributing to multiple organ dysfunction syndrome (MODS).[1] International Society of Thrombosis and Haemostasis (ISTH) defined DIC as an acquired syndrome characterized by intravascular activation of coagulation with loss of localization arising from different causes. It can originate from and cause damage to the microvasculature, which if sufficiently severe, can produce organ dysfunction[1,2,3]. DIC is supposed to occur due to endothelial damage and involves the microvascular environment. It can originate from and cause damage to the microvasculature, which if severe can produce organ dysfunction"[3, 4].

ISTH scoring system is an objective method to quantify DIC. It includes low platelet, PT, FDP and serum fibrinogen[3]. The DIC staging system proposed by Letsky[5] is also used to quantify DIC. It includes low grade compensated, uncompensated without hemostatic failure and uncompensated with hemostatic failure. According to ISTH, DIC score of ≥5 is known as overt DIC. Overt DIC is synonymous to uncompensated DIC. Obstetric causes leading to DIC include amniotic fluid embolism, acute fatty liver of pregnancy, placental abruption, severe preeclampsia/eclampsia, HELLP syndrome, IUD, and septicemia. Mortality of DIC ranges between 10% and 50%.[6]

MATERIALS AND METHODS

70 cases of DIC defined by altered laboratory parameters like reduced platelet count, elevated FDP, reduced S. fibrinogen and prolonged PT time coming to obstetrics and gynecology department of Civil Hospital at Ahmedabad, Gujarat from July 2011 to October 2013 were retrospectively studied. Maternal characteristics like age, gravida, underlying cause of DIC was recorded. Number of patients who expired was also found. Laboratory criteria of PT, platelet count, FDP, S.fibrinogen were recorded. DIC score was calculated using ISTH criteria. The patients were divided in two groups: Overt DIC (DIC score ≥ 5) and non-overt DIC (DIC score <

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5). Patients of PPH included PPH due to placenta previa, placenta percreta and atonic PPH. Chi-square (χ^2)test and Student-ttest were used to compare variables and tests were considered significant when P-Value <0.05.

RESULTS

19 out of 70 (27%) patients expired. Mean age of patients was 24.31 years range being 20-36 years. Mean gravida was 2.43 ranging from 1-7 (Table 1). There were 32 patients (46%) of overt DIC and 38 patients (54%) of non-overt DIC. Overall mortality rate was 27% (19/70). None of the patients with non-overt DIC died, while 19 out of 32 patients (59%) having overt DIC died. 20 out of 32 patients of overt DIC were < 25 years of age. The highest rate of mortality was for the age group < 25 years (11/45=24%). This is significantly different from the age group ≥ 25years (p = 0.003) (Table 2).

Table 1: Mean Age & Gravida

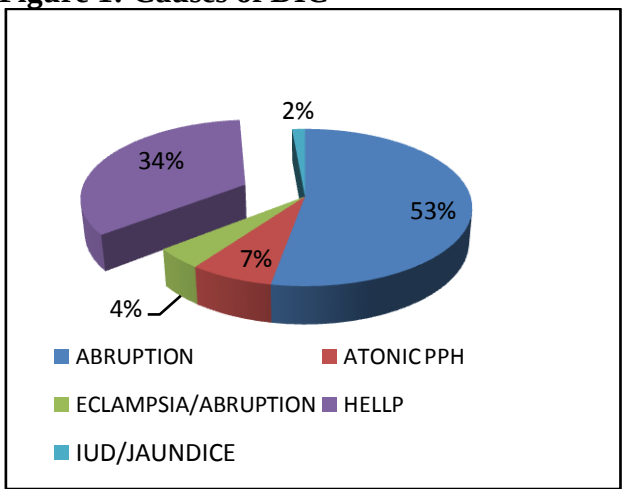
	Age	Gravida
Mean	24.31	2.43
Range	20-36	1-7
Median	23.5	2
SD	3.26	1.44
95% CI	24.31 ± 0.78	2.43 ± 0.34

Table 2: Age-wise Mortality Rate

	S	E	
< 25	34	11	45
25 to 30	17	4	21
> 30	0	4	4
	51	19	70
P-Value	**0.00303**	**Significant at 5%**	

The causes of DIC included abruption (53%), PPH(7%), HELLP(34%), eclampsia(4%), and AFLP(1%)(Figure 1).

Figure 1: Causes of DIC



Most common cause of overt DIC was HELLP (13/32) followed by Abruption (11/32). However, mortality of overt DIC was highest due to acute fatty liver of pregnancy (AFLP) (100%). The mortality rate due to PPH and Eclampsia were 75% and 66% respectively. However, common causes of overt DIC, abruption and HELLP carry a low mortality of 45% and 62%. Chances of developing overt-DIC in case of abruption and HELLP were 31% and 45% respectively (Table 3).

Table 3: Overt/Non-Overt DIC

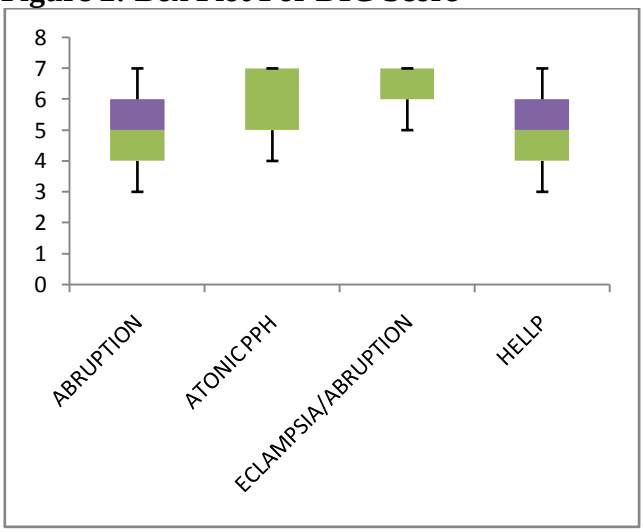
	Overt	Overt		Non-Overt	Total
		Survived	Expired		
Abruption		6	5	26	37
Atonic pph		5	8	1	14
Eclampsia/ Abruption		1	3	0	4
Hellp		1	2	11	14
Iud/ Jaundice		0	1	0	1
		13	19	38	70
P-Value	**0.02**	**Significant at 5%**			

One patient of AFLP is studied here who developed overt DIC. Range of DIC and their average are shown in figure (Table 4, Figure 2).

Table 4: Mean & Range of DIC Score

cause of DIC		DIC score	
		Mean	Range
Abruption	37	4.22	3-7
Atonic pph	5	6	4-7
Eclampsia/abruption	3	6.33	5-7
Hellp	24	4.92	3-7
Iud/jaundice	1	7	7
	70		

Figure 2: Box Plot For DIC Score



DISCUSSION

DIC develops when there is activation of coagulation system, inhibitory coagulation system and fibrinolytic system and anti-fibrinolytic system as a result of epithelial

injury. This leads to microvascular thrombosis. The generation of fibrin degradation substances and consumption of coagulation factors leads to bleeding at other sites. Microvascular thrombosis is a cause of multiorgan failure in these patients.

DIC has been quantified according to ISTH scoring system as overt and nonovert. Severity of the disease can also be determined by staging system given by Letsky EA[5]. Similarly, Japaneese Association of Acute Medicine[7] (JAAM) and Japaneese Ministry of Health and welfare[8] (JMHW) have devised a scoring system for acute DIC. All the scores take into account prothrombin time, platelet count, FDP, S. fibrinogen. ISTH scoring is 91% sensitive and 98% specific for diagnosis of DIC[9]. According to Bakhtiari et al (2004)[9,12], odds ratio of mortality is 1.25-1.29. The outcome of DIC predicted by odds ratio for mortality for the three scores is similar.[2,10,11]Serum fibrinogen is specific and low platelet and raised FDP sensitive for DIC. Since centre to the discussion of DIC lays endothelial injury, which also leads to SIRS, DIC score can also be used to monitor multiorgan failure. DIC score is an independent predictor of mortality in patients of multiorgan failure.

The absolute increase in prothrombin time rather than INR should be considered according to ISTH criteria.Platelets are the first to reduce but are non specific for DIC. Laboratory abnormality most commonly found is thrombocytopenia followed by elevated fibrin degradation products, PT,APTT. Reduced level of serum fibrinogen is least commonly seen.Increase in fibrin degradation products also lead to atony, inflammation and cardiotoxic shock.1 gm reduction in serum fibrinogen leads to 2.6 fold increase in PPH

Most common cause of DIC in our setting is abruption. In a population review of a tertiary care centre in Nova Scotia, Rattray DD, O'Connell CM, Baskett TFet al[13] showed that abruption was the most common cause of DIC followed by PPH, HELLP, AFLP, sepsis and amniotic fluid embolism. In our study, HELLP is the second most common cause due to improper antenatal care. Nova Scotia analysis also revealed higher DIC severity in PPH than abruption. It also showed that stage 3 DIC with hemostatic decompensation was more common in sepsis and amniotic fluid embolism followed by PPH and preeclampsia. In our study, higher mortality was found in overt DIC associated with AFLP, PPH and Eclampsia. Average DIC score in PPH and Eclampsia has been 6.3 and 6 respectively. AFLP showed a DIC score of 7.

Transfusion of blood components can help provide external coagulants and halt the vicious cycle of DIC. Platelets are transfused if platelet counts are less than 10000-20000/cu.mm. However in patients with bleeding and platelet count less than 50000, platelets are given. Platelet transfusion is also indicated when operative intervention is planned. Cryoprecipitate is helpful in case of decreasing serum fibrinogen. Fresh frozen plasma provides the coagulation factors. Antithrombin III concentrate and activated protein C (APC) have been found to be useful in DIC.

CONCLUSION

DIC is frequently encountered in clinical settings in obstetrics. Elimination of the cause can help halt and reverse the progression of DIC. However patients, in whom end organ damage due to DIC has occurred, have high chances of mortality. Removal of cause leading to DIC at a later stage can't help reverse multiorgan failure and the self perpetuating cycle of DIC at a decompensated stage is difficult to be halted and reversed. Hence overt DIC necessitates care of multiorgan failure and supply of components to break the vicious cycle of coagulation and anticoagulation.

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