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RESEARCH ARTICLE

A COMPARATIVE ANALYTICAL STUDY OF MATERNAL MORBIDITY AND MORTALITY INDICATORS BETWEEN PLACENTA ACCRETA SPECTRUM (PAS) AND NORMAL PLACENTATION DURING CAESAREAN SECTION

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Abstract

Introduction: The Placenta Accreta Spectrum (PAS) has emerged as a complex and increasingly prevalent condition, presenting formidable challenges in the field of obstetrics. PAS refers to a range of pathological conditions characterized by abnormal placental attachment to the uterine wall, leading to potentially life-threatening complications during pregnancy and childbirth. This condition has garnered significant attention from researchers, clinicians, and healthcare providers due to its rising incidence and the critical management decisions it demands.

Methods: This was a Case-Control study which was conducted at the department of Obstetrics and Gynecology in a tertiary care referral center in Akola, India between January 2020, and June 2021, over a period of 18 months (about 1 and a half years). Sample size calculation were considered based on the incidence of Placenta Accreta Spectrum as outlined by the study done by Wu S et al [4].

Result: As noted by earlier studies, our study also found an increase in the overall morbidity of the patients of Placenta Accreta Spectrum disorders over patients with normal placentation, during and after caesarean section.

Conclusion: Placenta Accreta Spectrum leads to significant maternal morbidity and mortality compared to normal placentation at caesarean section, as established by and increased rate of Obstetric Hysterectomies, longer operating times, increased need for blood and blood products, longer ICU stay, and increased rates of postpartum fever.

Introduction:-

Placenta Accreta Spectrum is a group of obstetric disorders involving the placenta, previously known as Morbidly Adherent Placenta, which involves pathological invasion of the placental trophoblasts into the uterine wall [1]. This includes Placenta Accreta, Placenta Increta, and Placenta Percreta, depending on the depth of the invasion of the trophoblasts into the uterine wall as well as the surrounding structures such as the bladder wall and rectum. [2]

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Since its first description in 1937 in Boston [3], the incidence has been climbing and has become common with a pooled incidence of about 1 in 533 deliveries [4]. It is one of the most morbid conditions in modern obstetrics responsible for a considerable number of patients ending up with Postpartum hemorrhage requiring massive blood transfusions, requiring peripartum hysterectomies, and even ICU admissions, an increase of mortality is also seen in such patients.

Inadequate research and a dearth of information on the subject [5] with obstetricians and Tertiary care centers leaves them ill-equipped to handle such obstetric emergencies and catastrophes and thus increasing awareness about such a topic is necessary, and for that adequate research on the morbidity and mortality associated with Placenta Accreta Spectrum is the need of the hour.

This study was conducted with the aim of quantifying the morbidity and mortality associated with Placenta Accreta Spectrum and to compare them with those of women with normal placentation during a caesarean section at Government Medical College, Akola.

Materials and Methods:-

This was a Case-Control study which was conducted at the department of Obstetrics and Gynecology in a tertiary care referral center in Akola, India between January 2020, and June 2021, over a period of 18 months (about 1 and a half years).

Sample size calculation were considered based on the incidence of Placenta Accreta Spectrum as outlined by the study done by Wu S et al [4].

Patients referred to our centre were considered and selected on the basis of the following factors for cases and controls.

The cases included all women with

1. Documented Placenta Accreta Spectrum, as per the following criteria

a. Difficult manual or piecemeal removal of placenta, if there was no separation of the placenta, despite Hospital protocol defined Active Management of Third Stage of Labour (AMTSL), including, but not limited to

Uterotonics such as high dose intravenous oxytocin infusion, Methylergometrine, Carbetocin, Carboprost

Massaging the uterine fundus; and

Controlled Cord Traction (Brandt Andrews Maneuver) [18].

b. Sonographic evidence of retained bits of placenta requiring curettage after normal delivery.

c. Heavy bleeding from placental bed site during caesarean section, requiring

Ligation of the Uterine Artery and/or Internal Iliac Artery

Removal of bleeding part and sewing the defect

Hysterectomy

d. Histological confirmation of a Hysterectomy, Excision and Repair, or Curettage specimen.

2. Women between the ages of 22-29 years old
3. Undergoing LSCS at our Institution

No Primigravida with Placenta Accreta Spectrum was seen in our study.

The controls included all women with

1. Documented absence of Placenta Accreta Spectrum, on

a. Absence of Placenta Accreta Spectrum on Imaging

b. No Placenta Accreta Spectrum in Intra-operative findings.

c. Absence of Histological confirmation on Hysterectomy samples.

2. Undergoing LSCS at our institution.
3. Women between the ages of 22-29 years.

The patients in the controls were matched to the cases with respect to all confounding factors, to have a case-control ratio of 1:1. The confounding factors matched were:

1. Age
2. Gravidity, Parity
3. Number of previous Caesarean Sections.
4. Previous Gynecological surgeries such as Dilation and Curettage, Hysteroscopy
5. History of Placenta Accreta Spectrum

The parameters compared included
1. Maternal morbidity indicators
a. Duration of surgery
b. Hemoglobin change after surgery
c. Requirement of blood and blood products
2. Need for an Obstetric Hysterectomy
3. Postpartum fever
4. Duration of ICU stay, and
5. Maternal mortality.

The patients were followed up for their entire duration of hospital stay, and in the case of 2 women managed conservatively, the follow-up was for about 2 months postpartum for serial beta-hCG levels.

Data collection was done on a standardized proforma after due consent taken from the patient and her relatives in a language that they could easily understand.

The data collected was analyzed using SPSS Inc., (Statistical Program for Social Science Inc.). Data collected was compared, tabulated, analyzed, and interpreted by using descriptive and inferential statistics based on the formulated objectives of the study. Quantitative variables were presented in terms of mean ± standard deviation. Level of significance "p" value was evaluated, where p value < 0.05 was considered statistically significant.

Results:-

In the present study, a total of 30 patients were considered, and were segregated based on the criteria into 15 cases as well as 15 controls. The baseline characteristics of both groups are as follows:

Table no 1:- Baseline characteristics of Case and Control groups.

Characteristic		Case	Control
Age		26.73 ± 2.55 years	25.13 ± 2.06 years
Gravida		3 ± 0.75	2.60 ± 0.73
Parity		1.86 ± 0.74	1.40 ± 0.63
Previous Caesarean Sections	0	01 out of 15 (6.67%)	0 out of 15
	1	08 out of 15 (53.33%)	11 out of 15 (73.33%)
	2	05 out of 15 (33.33%)	03 out of 15 (20%)
	3	01 out of 15 (6.67%)	01 out of 15 (6.67%)
History of Gynecological Surgery		3 out of 15 (20%)	2 out of 15 (13.33%)
History of Placenta Accreta Spectrum		0 out of 15	0 out of 15

For all the characteristics described above, the statistical differences were not significant (p > 0.05) and hence the cases and controls were evenly matched.

All the cases and controls underwent emergent caesarean section at our hospital and the patients were followed up for their entire duration of hospitalization, assessing all maternal morbidity and mortality characteristics mentioned above. The following are the results obtained:

Table 2:- Maternal Morbidity and Mortality characteristics of Case and Control groups.

Variable	Cases	Controls	p-value
Operative Time	211 ± 42.68 minutes	66.67 ± 41.47 minutes	<0.0001 (S)
Need for Obstetric Hysterectomy	13 out of 15 (86.67%)	02 out of 15 (13.33%)	<0.0001 (S)
Mean Change in Hemoglobin	3.93 g/dL	2.06 g/dL	<0.0001 (S)
Mean Packed Red Cells Needed	3.53 ± 1.12 units	1.06 ± 1.27 units	<0.001 (S)
Mean Fresh Frozen Plasma Needed	8.33 ± 1.99 units	2.00 ± 4.21 units	<0.001 (S)
Mean Platelet Concentrate	0.33 ± 1.19 units	0.00 ± 0.00 units	<0.001 (S)

Needed			
Duration of ICU Stay	5.27 ± 3.26 days	0.60 ± 1.29 days	<0.001 (S)
Placenta Previa	15 out of 15 (100%)	02 out of 15 (13.33%)	<0.0001 (S)
Postpartum Fever	08 out of 15 (53.33%)	03 out of 15 (20%)	0.04 (S)

(1 unit of Packed Red Cells = 250ml, 1 unit of Fresh Frozen Plasma = 150ml, 1 unit of Platelet Concentrate = 100ml)

Discussion:-

Placenta Accreta Spectrum is a major cause for maternal morbidity and mortality worldwide, and with the increasing number of cases, due to the higher rate of caesarean sections all over the world, it becomes a major burden on healthcare systems.

This study was undertaken to elicit any differences in the maternal morbidity and mortality between patients with Placenta Accreta Spectrum disorders and those with normal placentation. The study was conducted over 18 months (about 1 and a half years), with statistical analysis lasting for the last 2 months of the study period, and the major findings are summarized in this section.

As noted by earlier studies, our study also found an increase in the overall morbidity of the patients of Placenta Accreta Spectrum disorders over patients with normal placentation, during and after caesarean section.

There were no mortalities noted in our study on either arm, the cases or the controls, but this does not in any way imply that a correlation between Placenta Accreta Spectrum and increased mortality does not exist. This has been recorded in literature, most recently in a study conducted by the Latin American Group for the Study of Placenta Accreta Spectrum, recording the deaths due to Placenta Accreta Spectrum in Latin American countries and whether prevention of such deaths is possible or not [6]. It is also a part of the standard guidelines by the ACOG, and RCOG to prevent maternal mortality arising due to complications arising from Placenta Accreta Spectrum at centers other than tertiary care/level 3 centers for maternal care. It could be due multiple reasons such as:

1. Due to the smaller size of the study.
2. Good and prompt tertiary care management of the patients.
3. Availability of blood and blood products as well as a well-equipped ICU.

A better, more encompassing study which considers cases occurring in rural areas which may show the overall mortality burden of Placenta Accreta Spectrum should be carried out.

The cases and controls were matched for all confounding factors, such as:

1. Age
2. Gravida and Parity status
3. History of Previous Caesarean Section
4. History of Placenta Accreta Spectrum disorders in earlier pregnancy

After matching all the factors, the results were compiled, and the following observations were made.

The cases with Placenta Accreta Spectrum disorders had a mean operating time of about 211 ± 42.68 minutes and control were 66.67 ± 41.47 minutes (p value <0.01). This shows that the average operating time for a patient with Placenta Accreta spectrum disorders is significantly longer compared to those without, and this could be due to several factors such as [7]:

1. Vascularity of the lower uterine segment
2. Type of incision taken
3. Presence of adhesions/ difficult abdominal access
4. Requirement for ligation of arteries due to intraoperative blood loss
5. The need for Peripartum Hysterectomy

All these factors are more common in the case of Placenta Accreta Spectrum disorder patients and need to be considered for future surgeries on such patients. Implications of a prolonged operating time are [8]

1. Increased pain in the postoperative period
2. Increased need for analgesics, and antibiotics

3. Increased blood loss
4. Increased mortality of the patient

Considering all these factors, the problem of prolonged operating time is immense for further research and management of the patients, and on the increased requirement of specialists for the same.

In the cases of Placenta Accreta Spectrum disorders, the cases had a higher chance of an Obstetric/Peripartum Hysterectomy, with 13 out of the 15 cases (86.67%) requiring one compared to 2 out of the 15 controls (13.33%). This is in line with earlier research which suggests an increased rate of Peripartum Hysterectomies in patients of Placenta Accreta Spectrum disorder [9].

As a measure of blood losses during surgery, we used change of hemoglobin pre and postoperatively, as well as the requirement for blood products, the result is as follows

1. The average reduction in hemoglobin in the cases was about 3.93 g/dL and that in the controls was 2.06 g/dL. Indicating a statistically significant decrease in hemoglobin in cases compared to controls ($p<0.05$).
2. The whole blood needed among cases was 3.53 ± 1.12 units and control were 1.06 ± 1.27 units. The whole blood requirement among cases was much more compared to control with significant difference. ($p<0.05$)
3. The Fresh Frozen Plasma among cases was more (8.33 ± 1.99 units) compared to controls (2.00 ± 4.21units) with significant difference. ($p<0.05$).
4. The platelets were needed among cases only (0.33 ± 1.19 units) compared to controls with significant difference. ($p<0.05$).

This can be seen in the paper by Usta et al. From the University of Beirut, comparing the blood loss between Placenta Accreta Spectrum disorders and Placenta Previa, which showed the following results [5]

1. Blood loss in patients with Placenta Previa without Accreta was lower at 847 ± 420 ml, compared to those with Placenta Accreta 2262 ± 1261 ml.
2. Transfusion was required by almost all (95.5%) cases of Placenta Accreta Spectrum versus only a quarter (25.2%) of controls.

As seen by the points the amount of blood loss was always more in the cases of Placenta Accreta Spectrum compared to normal placentation of the control group, due to several factors such as

1. Longer Operative time
2. Increased vascularity of the lower uterine segment
3. Difficult removal of the placenta
4. Concurrent Placenta Previa
5. Peripartum/Obstetric Hysterectomy

This is in line with majority of studies conducted by multiple hospitals and a consensus of all major Obstetrics and Gynecology groups, such as the International Federation of Obstetrics and Gynecology (FIGO), American College of Obstetrics and Gynecology (ACOG), and the Royal College of Obstetrics and Gynecology (RCOG) [1,10,11,12].

Another measure of morbidity is the amount of time the patient was admitted to the ICU requiring intensive monitoring and treatment with a multidisciplinary team of doctors. The ICU stay among cases was more (5.27 ± 3.26 days) compared to controls (0.60 ± 1.29 days) with significant difference. ($p<0.05$).

It was seen that 8 (53.33%) patients in cases had postpartum fever compared to only 3 (20%) patients in controls with significant statistical difference amongst two groups ($p<0.05$). This is a sign of increased morbidity in the cases, either due to

1. A longer operating time
2. Increased blood loss
3. Transfusion of multiple blood products

All related to the presence of Placenta Accreta Spectrum in the cases compared to the controls.

Placenta Previa was seen in all cases (100%) compared to 2 (13.33%) patients in control with significant statistical difference. ($p<0.05$). This is like most other research papers in which the established most common high-risk factor for Placenta Accreta Spectrum was Placenta Previa, with or without previous caesarean section scar. [13]

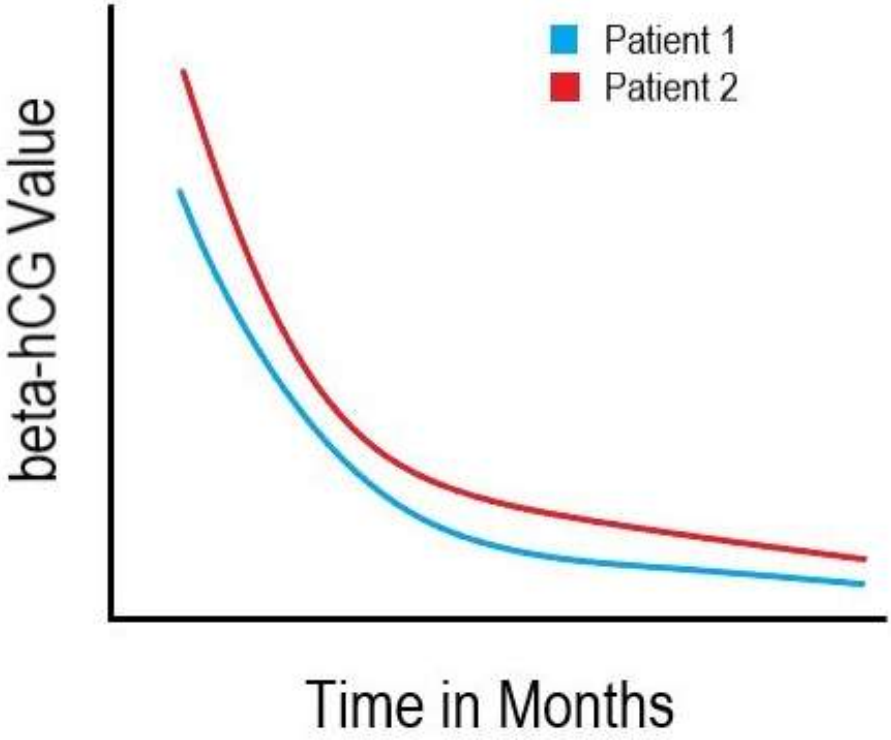
In the case of the two patients who were managed conservatively, a follow-up of 2 months was kept with weekly beta-hCG values and OPD visits for assessing the patients' complaints if any, and to assess the clinical signs such as:

1. Bleeding per vaginum
2. Urinary leakage per vaginum
3. Blood in the urine
4. Symptoms of a Urinary Tract Infection
5. Abdominal Pain and Tenderness
6. Fever, Hypotension, Tachycardia

The follow-up was stopped after the beta-hCG values reached close to 0, and the patients had their first menses within 4 months of the last follow-up.

The commonality in both the cases in whom conservative management was done, is the following:

1. Both had anterior placenta previa.
2. Both patients had placenta percreta, which invaded through the serosa but not invading the bladder muscularis, this allowed for easy separation of the segment of the uterus to be resected, without injuring the bladder or ureters.
3. Absence of dense adhesions between the uterus and the anterior abdominal wall, or between the other abdominal structures such as the ureter, urinary bladder, ovaries or fallopian tubes.
4. The placenta was not invading deep into the upper segment of the uterus, being limited to the lower segment and allowed the surgeon to easily take an incision above it and avoid major hemorrhage.



The beta-hCG values can be noted to be in a declining trend for about 2 months after which a value of less than 15 was the cut off to stop follow-up. The women had their first menses within 4 months of this value being achieved.

Conclusion:-

Placenta Accreta Spectrum leads to significant maternal morbidity and mortality compared to normal placentation at caesarean section, as established by and increased rate of Obstetric Hysterectomies, longer operating times, increased need for blood and blood products, longer ICU stay, and increased rates of postpartum fever.

New in this Study
Considering the burden of the disease in modern obstetrics, this study adds to the vast knowledge of Placenta Accreta Spectrum already available, and supports all of the previously mentioned points about increased morbidity and mortality. it like other studies are a needed addition towards improvement in patient outcomes and for education of practicing professionals in treating/referring such cases.

Author Contributions
All authors contributed equally in planning, preparation and execution of the study. The manuscript preparation was done with inputs from all authors.

Compliance with Ethical Standards
Conflicts of interest
All authors declare they have no conflicts of interest

Ethical Approval
All procedures performed in studies involving human participants were as per the ethical standards of the institution and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards

Informed Consent
Informed consent was obtained from all individual participants included in the study.

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