

Original Research Article

A study on correlation of placenta praevia with previous caesarean section and other risk factors

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ABSTRACT

Background: Obstetric haemorrhage is the leading cause of preventable maternal mortality worldwide. One of the major contributors to obstetric haemorrhage is antepartum haemorrhage which is mainly caused by placenta praevia and abruptio placenta. The study aims to quantify the risk of placenta praevia based on the presence and number of caesarean sections and to assess other risk factors.

Methods: This study was a prospective case control study conducted in the department of obstetrics and gynecology, Lalla Ded hospital, Srinagar, Jammu and Kashmir, India from August 2009 to October 2010. As per the inclusion and exclusion criteria of study 100 cases and 200 controls were selected and the association of placenta praevia with proposed risk factors was analysed statistically.

Results: Present study showed that the risk of developing placenta praevia in future pregnancy increased steadily as the number of previous caesarean sections increased, risk being 2.1, 2.8 and 4 times with previous one, two and three caesarean deliveries respectively. Similarly, the risk of developing placenta praevia was more in women with history of previous abortion (risk being 2.8 and 6.5 times more in women with one and two abortions in the past). Previous dilatation and curettage and age more than 30 years also proved to be independent risk factors.

Conclusions: To conclude advanced maternal age, previous abortion, dilatation and curettage and a history of previous caesarean section appear to increase the occurrence of placenta praevia. The study strongly emphasises the need to decrease the primary caesarean section rate.

Keywords: Abortion, Antepartum haemorrhage, Caesarean section, Dilatation and curettage, Placenta praevia

INTRODUCTION

According to the World Health Organization (WHO), in 2015, roughly 303 000 women died during and following pregnancy and childbirth. It has been observed that around 27.1% of the maternal deaths, reported by WHO, were due to obstetric haemorrhage.¹ Obstetric haemorrhage is broadly classified as antepartum, intrapartum and postpartum haemorrhage. Antepartum

haemorrhage has always been one of the most feared complication in obstetrics. It is defined as any bleeding from the genital tract during pregnancy, after the period of viability until the delivery of foetus.² The most important causes of antepartum haemorrhage are placenta praevia and abruptio. In a meta-analysis done by Cresswell JA et al, the prevalence burden of placenta praevia in different world regions was estimated.³ The overall prevalence of placenta praevia was 5.2 per 1000

pregnancies (95% CI: 4.5-5.9) and the highest prevalence was noted among Asian studies (12.2 per 1000 pregnancies).³ In the subsequent paragraph, a brief description on the established theories that identify probable causes of placenta praevia has been given.

It was Paul Portal (1630-1703), a physician at the Hotel Dieu in Paris, who was the first to clearly describe the attachment of the placenta to the lower uterine segment in a case of placenta praevia.⁴ As per the literature, placenta praevia is a condition in which placenta is implanted somewhere in the lower uterine segment, either over or very near the internal cervical os.⁵

As of today, the exact aetiology of placenta praevia is unknown. The condition may be caused by multiple factors such as previous caesarean section, multiparity, advanced maternal age, smoking, previous abortion and dilatation and curettage.⁶ Some of the major theories indicate endometrial and myometrial damage in the uterus and defect in the placental migration mechanism as the causes of placenta praevia. Any abnormality in the endometrial vascularization and prior trauma to the endometrium or myometrium appear to influence the site of implantation and thus may contribute to the probability of placenta praevia.⁷ According to Dashe JS et al, the placenta generally migrates to better vascularized areas.⁸ Normally, the placenta grows towards the fundus, which can provide more blood. Defective vascularization of the endometrium due to scarring or atrophy caused by previous operations or infections may lead to reduced differential growth of the lower uterine segment and less of an upward shift in placental location.⁸

In the previous text, author have discussed about caesarean section being a probable cause for placenta praevia. With the increasing advances in modern obstetrics there also has been an increase in caesarean section rate in recent times. According to a data from 150 countries, collected from 1990 to 2014, 18.6% of all births were done under knife, ranging from 6% to 27.2% in the least and most developed regions, respectively. Based on the data from 121 countries, the trend analysis showed that between 1990 and 2014, the global average caesarean section rate increased 12.4% (from 6.7% to 19.1%) with an average annual rate of increase of 4.4%.⁹

An unwanted consequence of the rising caesarean section rate is abnormal placentation, in subsequent pregnancies, leading to clinical complications of placenta praevia and placenta accrete. All these conditions are associated with increase in maternal mortality and morbidity. The following study was conducted to provide additional statistical data in support of the existing theories on placenta praevia due to previous caesarean sections. Additionally, based on the collected data, other risk factors for placenta praevia such as advanced maternal age, multi-parity, previous abortions and dilatation and curettage were established.

METHODS

The present study was conducted in the department of obstetrics and gynaecology, Lalla Ded hospital, Srinagar, the main tertiary health care maternity centre in Kashmir valley. The study was conducted from August 2009 to October 2010, in which 100 patients with ultrasound documented placenta praevia served as cases in the study group and 200 patients not having placenta praevia were taken as control group. In order to assign patients to the study group and the control group, following inclusion and exclusion criteria were taken.

Inclusion criteria

Pregnant women at or more than 30 weeks of gestation who had ultrasound documented placenta praevia, irrespective of their parity and between the age of 20 to 40 years, coming to emergency department or admitted in antenatal ward were included in the study.

Exclusion criteria

- All the pregnant women presenting with bleeding per vaginum or low-lying placenta before 30 weeks of gestation.
- Antepartum haemorrhage due to abruptio placentae or any other local cause.
- Pregnancy complicated with other medical disorders like pregnancy induced hypertension, diabetes mellitus and thyroid disorders.

After taking an informed consent, a detailed and comprehensive history was taken from each patient according to the proforma which included

- Sociodemographic history: This included the residence and age of patient.
- Obstetric history: This included gravidity, parity, gestational age at the time of presentation and presenting complain.
- A detailed general physical, systemic, per abdomen and local examination was conducted in each patient. It was enquired whether the patient had history of following:
 - Previous caesarean section
 - Previous abortion and dilatation and curettage
 - Previous myomectomy
 - Smoking

All the patients were subjected to routine investigations like haemoglobin, clotting time, bleeding time, platelet count and blood group. Ultrasound findings of all the patients were noted down.

Statistical analysis

The data obtained during the study was analysed by using statistical techniques like student's t- test, Mann-Whitney

U test, chi-square test, odds ratio (OR) and adjusted odds ratio (AOR) Multivariate analysis was also applied. The risk factors that proved significant in univariate analysis were further subjected to multivariate binary logistic regression analysis. All the p-values <0.05 were taken as significant. The software used for data analysis was SPSS (Statistical Package for Social Sciences) 11.5

RESULTS

73% of patients in the study group were between 31 to 40 years of age as compared to 44% in the control group (Table 1).

When we compared the gravida and para status of the patients (Table 2), we found that only 31% of controls were gravida 3 or more as compared to 54% of the cases.

Similarly, as compared to 12% of patients in the study group 8.5% of patients in control group were para 3 or more.

As previously discussed, the identified risk factors for the current study are history of abortion, history of caesarean section and history of dilatation and curettage (Table 3).

Table 1: Age (year) distribution in the study and control group.

Age (years)	Study		Control		p value
	n	%	n	%	
20 to 30	27	27	112	56	0.000(Sig)
31 to 40	73	73	88	44	

Table 2: Gravidity and parity in the studied subjects.

		Study		Control		p value
		n	%	n	%	
Gravida	1 to 2	46	46	138	69	0.000 (Sig)
	≥ 3	54	54	62	31	
Parity	0 to 2	88	88	183	91.5	0.010 (Sig)
	≥ 3	12	12	17	8.5	

Table 3: Correlation of different risk factors with placenta praevia.

	Study		Control		Result
	n	%	n	%	
History of Abortion	41	41.0	32	16.0	p= 0.000 (Sig)
History of Caesarean section	40	40.0	42	21.0	p= 0.001 (Sig)
History of dilatation and curettage	41	41.0	32	16.0	p= 0.000 (Sig)

As against 41% of patients in the study group only 16% of patients in the control group had a history of previous abortion. This pointed towards a significant correlation (p-value <0.05). As against 40% of patients in the study group only 21% of controls had a history of caesarean section (p-value 0.001). Similar correlation was found between history of dilatation and curettage and risk of developing placenta praevia in future pregnancy (p-value 0.000).4% of patients in the study group were smokers whereas such history was present only in 0.5% of controls (Table 4). Thus, the association of maternal smoking with placenta praevia was statistically significant (p-value 0.026). Only one patient out of 100 studied cases had a history of myomectomy done in the past.

Table 4: Percentage of patients with history of smoking and myomectomy in the study and the control group.

	Study		Control		p value
	n	%	n	%	
History of Smoking	4	4.0	1	0.5	0.026 (Sig)
History of Myomectomy	1	1.0	0	0.0	0.157 (NS)

As shown in Table 5, we compared the difference in the incidence of various blood groups in the study and control group and found it to be statistically insignificant (p-value 0.718). In both cases and controls 27% of patients had A+ blood group. 8% of patients in the study group and 4.5% in the control group had A- blood group. About one quarter of the patients in the study group had B+ blood group whereas the number was slightly more in the control group. Percentage of patients having B- and AB+ blood group was same for both cases and controls. AB- blood group was rare in both cases and controls.

Table 5: Percentage of patients in the study and the control group with various blood groups.

Blood Group	Study		Control		p value
	n	%	n	%	
A+Ve	27	27.0	54	27.0	0.718 (NS)
A-Ve	8	8.0	9	4.5	
B+ve	24	24.0	67	33.5	
B-Ve	5	5.0	10	5.0	
AB+ve	5	5.0	10	5.0	
AB-Ve	1	1.0	1	0.5	
O+Ve	29	29.0	42	21.0	
-Ve	1	1.0	7	3.5	

Quantification of risk of placenta praevia was done based on the presence of risk factors being studied (Table 6). Women with previous one and two abortions were 2.8 and 6.5 times more at risk of developing placenta praevia respectively, than those with no abortions in the past. Risk of development of placenta praevia was 2.1, 2.8 and 4 times more as the number of previous caesarean sections increased from one, two to three respectively. Placenta praevia occurred 2.6 and 7.3 times more

commonly in patients with previous one and two dilatation and curettage respectively (Figure 1).

The association of previous three abortions and previous three dilatation and curettage with development of placenta praevia could not be evaluated because of a smaller number of patients. The above results were statistically significant (p-value <0.05).

Table 6: Quantification of risk of placenta praevia in high risk group patients.

	Study		Control		Result
	n	%	n	%	
History of Abortion	41	41.0	32	16.0	p= 0.000 (Sig)
Number of Abortion	1	31	28	14.0	OR#= 2.8
	2	9	3	1.5	OR= 6.5
	3	1	1	0.5	OR= 2.0
History of Caesarean section	40	40.0	42	21.0	p= 0.001 (Sig)
Number of Caesarean-section	1	25	31	15.5	OR= 2.1
	2	14	11	5.5	OR= 2.8
	3	1	0	0.0	OR= 4.0
History of curettage done	41	41.0	32	16.0	p= 0.000 (Sig)
Number of Curettages done	1	30	28	14.0	OR= 2.6
	2	10	3	1.5	OR= 7.3
	3	1	1	0.5	OR= 2.0

#OR is odds ratio

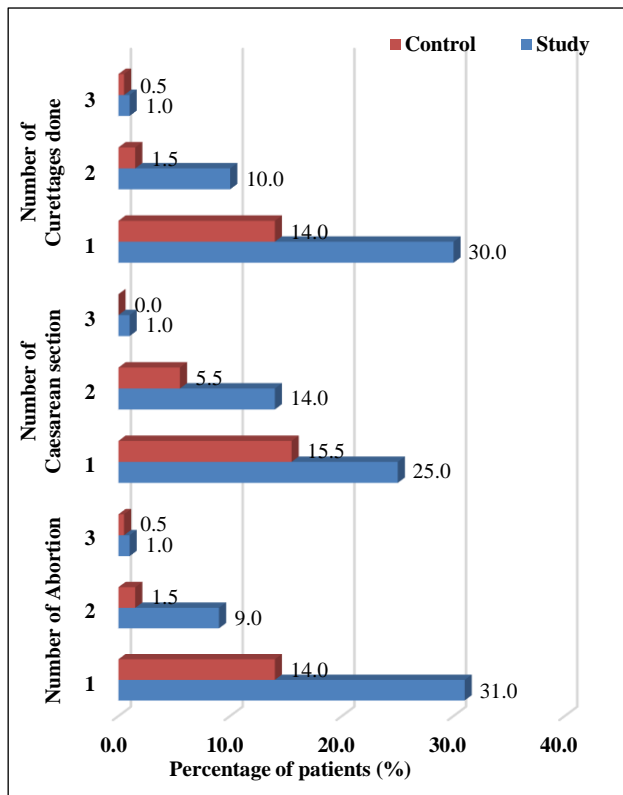


Figure 1: Correlation of placenta praevia with different risk factors

By calculating the adjusted odds ratio (AOR), multivariate analysis by logistic regression predicted previous abortion (AOR 22.6), previous dilatation and curettage (AOR 22.6), age more than 30 years (AOR 22.5) and previous caesarean section (AOR 12.1) to be associated with development of placenta praevia in future pregnancy. This analysis did not show increasing parity and maternal smoking to be significant risk factor (Table 7).

Table 7: Multivariate analysis by logistic regression.

Variables	AOR	p-value	Result
Abortion	22.6	0.000	Sig
Dilatation and Curettage	22.6	0.000	Sig
Age	22.5	0.000	Sig
Caesarean	12.1	0.000	Sig
Parity	0.9	0.334	NS
Smoking	5.0	0.026	NS
Myomectomy	2.0	0.157	NS
Overall Statistics	52.0	0.000	Sig

DISCUSSION

According to one data, regarding the country level trends in maternal mortality from 1990 to 2015, Nigeria and India were estimated to account for over one third of all maternal deaths worldwide in 2015. While 58 000 maternal deaths occurred in Nigeria, the number was

45000 for India.¹⁰ Considering the burden of maternal mortality in India, it is pertinent to analyse its causes and execute all possible measures to ensure safe obstetric care. As is known, haemorrhage still remains a leading cause of maternal mortality and morbidity. Placenta praevia is an important cause of antepartum haemorrhage in mothers and mortality and morbidity in babies.

In 1985, the world health organisation in a consensus statement suggested that there may be no health benefits from caesarean section rates exceeding 10-15%. These figures have, however, been surpassed in most affluent societies and are now a subject of public health concern. The caesarean section rates in united states increased by 53% from 1996 to 2007 reaching 32%.¹¹ The incidence also varies immensely between public and private institutions, caesarean section rates up to 70% reported from private set up.¹² In view of the rising caesarean section rate, the present study analyses the risk of development of placenta praevia based on the presence and number of previous caesarean sections and other risk factors. This study provides yet another reason for reducing the rate of primary caesarean section and for advocating vaginal birth for women with prior caesarean section for non-recurrent causes.

It was observed that in the study group, majority (73%) of the patients were between 31 to 40 years of age as compared to 44% in the control group. There was a clear statistically significant difference in the age between the two groups. In a study done by Rose S AA and Usha Gopalan U in 2015, it was concluded that women aged ≥ 35 years or more had increased risk of placenta praevia (3.6%) which was statistically significant ($p < 0.05$) by Chi-square test.¹³ Similar observations were also made by Dr Aslam Mehmood Malik AM et al, in their study of 50 patients of ultrasound documented placenta praevia, in which maximum number of cases were in the higher age group (72%).¹⁴ Increasing maternal age has been a worldwide trend. In the United States, live births among women aged ≥ 35 years increased from 5% to 13% between 1970 and 2000, and the average age of first-time mothers increased from 21.4 years to 25.0 years between 1970 and 2006. This tendency may be caused by delayed marriage, increasing rates of divorce, development of assisted reproductive technology, effective birth control, women's higher education levels, and increases in women's social activity.¹⁵ In light of the above trend regarding increasing maternal age it becomes all the more important to study the associated risk factor. The mechanism by which advanced maternal age impairs normal placental development is unclear but increase in the percentage of sclerotic changes on intra myometrial arteries with age and thereby reducing blood supply to the placenta could be a cause.¹⁶

The correlation of increasing gravidity and occurrence of placenta praevia was analysed in both the study and control group and it was found that while as 54% of patients in the study group were either gravida three or

more, the percentage was 31% among controls. Bhat SM et al, conducted a retrospective study on 58 patients of placenta praevia and found that 44% of the patients were either gravida five or more.¹⁷ This suggested that the risk of development of placenta praevia increases with increasing gravidity, which is similar to the results of present study. In the present study, the risk of placenta praevia also increased with increasing parity. This is evident from the fact that 12% of patients in the study group were para three or more as compared to 8.5% in the control group. Nasreen F et al, conducted a study at Peshawar and found that there were seven times as many multiparas having placenta praevia as nulliparas.¹⁸ According to a study done by Cieminski A and Dlugolecki F, the incidence of placenta praevia in women with previous deliveries was significantly higher compared to the group of primiparas and increased as the number of prior deliveries increased.¹⁹ In some studies, it is suggested that multiparity causes atherosclerotic changes in the uterus which may lead to infarction and under perfusion of the placenta. This under perfusion may cause increase in size of placenta and thus a placenta which encroaches the lower uterine segment.²⁰

In this study, 41% of patients in the study group had history of abortion as compared to 16% in the control group. In a metanalysis done by Karami M et al, it was found that there is a significant association between prior spontaneous abortions and placenta praevia (1.77; 95% CI: 1.60, 1.94) and between prior induced abortions and placenta praevia (1.36; 95% CI: 1.02, 1.69).²¹

It was found that 40% of patients in the study group had a history of previous caesarean section as compared to 21% in the control group. The difference was statistically significant and supported the association of previous caesarean section and development of placenta praevia in future pregnancy. The results are consistent with the study done by Mahmood Malik AM et al, who found that the incidence of previous caesarean section in the patients of placenta praevia was 52% as compared to 24% in the control group.¹⁴ In a study done by Bellalawetha S, 400 subjects with history of previous caesarean Section were selected for study purpose.²² 400 subjects with no previous history of caesarean section were taken as control group. The incidence of placenta praevia in the study group was 6% compared to only 1.75% in control group ($p < 0.05$).²² The possible explanations for caesarean section to be a risk factor for the development of placenta praevia may be the damage and scarring of the uterus caused by a caesarean section. Other reason may be the attraction and adherence of the placenta to the caesarean scar. The scarring may also interfere with the normal process of placental migration and physiological development of lower uterine segment.²⁰

Present study showed that 41% of patients in the study group had a history of dilatation and curettage as compared to 16% in the control group. This difference is statistically significant. In a study done in Uganda by

Kiondo P et al, a history of evacuation and or dilation and curettage of the uterus were associated four times with the risk of placenta praevia.²⁰ Possible explanation for dilatation and curettage predisposing for the development of placenta praevia in future may be the under perfusion of the uterus caused by scarring due to evacuation.²⁰

Four patients in the study group had a history of smoking as compared to only one in the control group. Although, the number of patients with a history of smoking was very less, these figures revealed a significant statistical association (p-value =0.026). Only one out of 100 patients in the study group had history of myomectomy done in the past whereas none of the patients among controls had such a history. The association of previous myomectomy with placenta praevia could not be evaluated because of a smaller number of cases. In the study done by Malik AM et al, in Bahawalpur, 30% of patients in the study group had history of smoking as compared to 16% in the control group.¹⁴ William and colleagues found a two-fold increase in the occurrence of placenta praevia due to smoking. They postulated carbon monoxide hypoxemia causing compensatory placental hypertrophy as the cause.⁵

It was observed that the difference in the incidence of various blood groups in the study and control group was not statistically significant. The results were comparable to those obtained by Zoona S et al, in their study.⁶

The strength of association between number of previous abortions and development of placenta praevia was studied by calculating the odds ratio (OR). Authors found that women with previous one and two abortions had 2,8 and 6.5 times more risk of developing placenta praevia respectively, than women with no abortion. Although the risk appears to be decreasing with three abortions, this may be because of a smaller number of patients with three abortions. This kind of association was further supported by the study conducted by Sangeeta et al, who reported that women with previous abortion had higher risk of developing major placenta praevia in future (OR 2.5).¹⁷

It was observed that women with previous one, two and three caesarean sections had 2.1, 2.8 and 4 times greater risk of developing placenta praevia in future pregnancies respectively. These observations were comparable with those reported by Galliam ML et al, who found that the risk of placenta praevia for women with one caesarean section was 1.21 times more than those who do not have history of caesarean in the past.²³ Moreover, women with two and three prior caesarean deliveries were 2.65 and 4.4 times more at risk of developing placenta praevia respectively. According to Kiondo P et al, the risk of developing placenta praevia in future pregnancy was 4.5 times for one caesarean section in the past and increased to 44.9 for four or more caesarean deliveries.²⁰

In the present study women with previous one and two dilatation and curettage were found to be having 2.6 and 7.3 times increased risk of developing placenta praevia respectively when compared to those with no previous dilatation and curettage. Risk associated with previous three dilation and curettage could not be evaluated. In a study done by Kiondo P et al, previous history of evacuation of uterus (OR3.6 95% CI 1.1-12.5) was associated with increased risk of developing placenta praevia.²⁰

Multivariate analysis was done and adjusted odds ratio (AOR) was calculated. It predicted four factors to be associated with placenta praevia; previous abortion (AOR 22.6), previous dilation and curettage (AOR 22.6), age more than 30 years (AOR 22.5) and previous caesarean section (AOR 12.1). Although univariate analysis proved the association of higher parity and history of smoking with placenta praevia, both of them were not found significant when studied by multi variate analysis. Not enough patients were found to study the association of previous myomectomy with placenta praevia. Sheiner E et al, studied 298 patients of placenta praevia.²⁴ In his study a back step multiple logistic regression model found the following factors to be independently correlated with the occurrence of placenta praevia; maternal age above 40 years (OR3.1), previous caesarean section (OR1.8) and a history of habitual abortion (OR13.95). Melissa L et al, found that the likelihood of placenta praevia increases as both parity and number of caesarean sections increased such that the likelihood of placenta praevia for a woman with parity greater than four and more than four caesarean deliveries was 8.76 (OR 8.76).²³

CONCLUSION

Based on the statistical analysis, we concluded that the risk of developing placenta praevia in future pregnancy increases with history of previous abortion, a greater number of dilatation and curettage, higher order of caesarean section, advanced maternal age, increasing parity and maternal smoking. The patients with above risk factors should be screened for it early in the antenatal period so as to refer them to an appropriate centre at the correct time and decrease maternal and foetal morbidity and mortality.

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