

## Risk Factor Analysis of the Incidence of Placenta Previa at RSUP Dr. Mohammad Hoesin Palembang in 2020–2021

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### Abstract

Placenta previa is a placenta that lies at the bottom of the uterus, above or very close to the internal cervical ostium. The exact cause of placenta previa is still unknown, but several factors have been associated with an increased risk of placenta previa. This study aims to determine the relationship between maternal age, parity, distance between pregnancies, history of placenta previa, history of cesarean delivery, history of curettage, assisted reproductive technology, multiple pregnancies, and fetal gender on the incidence of placenta previa at RSUP Dr. Mohammad Hoesin Palembang in 2020-2021. This study is an observational analytic study with a case control design. This study used secondary data from medical records of obstetric patients at RSUP Dr. Mohammad Hoesin Palembang in 2020-2021 that met the inclusion criteria and exclusion criteria. The study sample amounted to 100 people consisting of 50 cases and 50 controls. The results of bivariate analysis using the chi-square test and the fisher exact alternative test showed that maternal age ( $p=0.010$ ), parity ( $p=0.038$ ), history of cesarean delivery ( $p=0.000$ ), and history of curettage ( $p=0.001$ ) had a significant relationship with the incidence of placenta previa. Distance between pregnancies ( $p=0.204$ ), history of placenta previa ( $p=0.242$ ), and fetal sex ( $p=0.162$ ) did not have a significant relationship with the incidence of placenta previa. The results of multivariate analysis using binary logistic regression test showed that the most influential risk factors for the incidence of placenta previa were history of cesarean delivery ( $OR=54.751$ ) and history of curettage ( $OR=20.204$ ). It can be concluded that a history of cesarean delivery and a history of curettage are the most influential risk factors for the incidence of placenta previa.

**Keywords:** Risk Factors, Placenta Previa, Maternal Age, Parity, Distance Between Pregnancies, History of Placenta Previa, History of Cesarean Delivery, History of Curettage, Assisted Reproductive Technology, Multiple Pregnancy, Fetal Sex.

### 1. Introduction

The health status of a country is determined by several indicators, one of which is the Maternal Mortality Rate (MMR).<sup>1</sup> WHO data in 2017 shows that the maternal mortality rate is still very high, namely around 810 mothers die every day.<sup>2</sup> In Indonesia, based on data from the Ministry of Health, in 2019 there were 4,221 maternal deaths and in 2020 there were 4,627 maternal deaths recorded.<sup>1</sup> In South Sumatra Province, there were 105 maternal deaths in 2019 and 128 maternal deaths in 2020. The highest causes of death in pregnant women in South Sumatra in 2020

were due to bleeding, namely 42 cases (31.25%).<sup>3</sup>

One of the most common causes of antepartum hemorrhage is placenta previa.<sup>4</sup> Placenta previa is the placenta located at the bottom of the uterus, above or very close to the internal cervical ostium.<sup>5</sup> The prevalence of placenta previa varies widely worldwide, with Asia having the highest rates (12.2:1000 pregnancies) and Europe, North America, and Africa having the lowest rates (2.7:1000–3.6:1000 pregnancies).<sup>6</sup> Several researchers report that the prevalence of placenta previa

in Indonesia ranges from 2.4–3.56%, while the prevalence in developed countries is 0.26–2%.<sup>7</sup>

The exact cause of placenta previa is still unknown, but several factors have been linked to an increased risk of placenta previa occurring.<sup>8</sup> Several studies report risk factors associated with placenta previa including advanced maternal age, parity, *assisted reproductive technology*, cesarean section history, placenta previa history, curettage history, and recurrent abortions (2.5%).<sup>9,10</sup> Placenta previa may also increase the risk of morbidity and mortality in mothers and infants. Women with placenta previa are at risk of cesarean section, hysterectomy of peripartum, abnormal attachment of the placenta, or postpartum bleeding. Premature birth, perinatal death, congenital abnormalities, and low APGAR scores are risks from placenta previa for newborns. Babies are at risk of experiencing disorders in the form of small for gestational age (SGA) and low birth weight (LBW). Most babies born to mothers with placenta previa require resuscitation and NICU care.<sup>11</sup>

In connection with the high morbidity and mortality rates in mothers and babies caused by placenta previa, as well as varied risk factors, research on the analysis of risk factors for placenta previa events at RSUP Dr. Mohammad Hoesin Palembang as a national teaching and referral hospital in South Sumatra Province is important to do.<sup>12</sup>

## **2. Methods**

The research conducted was an observational analytic study with a case control design. This study was conducted using secondary data from the medical records of obstetric patients at Dr. Mohammad Hoesin Hospital Palembang. This study was conducted from October to November 2022 at the Department of Obstetrics Gynecology and Medical Records Installation of RSUP Dr. Mohammad Hoesin Palembang.

The sample of this study was placenta previa patients at RSUP Dr. Mohammad Hoesin Palembang for the period January 1, 2020–December 31, 2021 who met the inclusion and exclusion criteria. Case samples were mothers with gestational age  $\geq 24$  weeks and laboring mothers who experienced placenta previa with bleeding. Control samples were mothers with gestational age  $\geq 24$  weeks and normal/physiological labor without complications. The diagnosis of placenta previa was based on an ultrasound examination. The sample size was calculated using the unpaired categorical data formula and obtained a minimum sample size of 41 people. Sampling using a purposive sampling technique.

The results of data collection were processed using the statistical package for social science (SPSS) 26.0 program. Analysis was carried out in univariate, bivariate, and multivariate. The test used in the bivariate analysis was the chi-square test or an alternative test in the form of the fisher exact test and the test used in the multivariate analysis was the binary logistic regression test.

## **3. Results**

The sample obtained in this study was 100 patients, consisting of 50 case group patients and 50 control group patients. The results of the study found that the incidence of placenta previa with bleeding in pregnant women and maternity mothers at RSUP Dr. Mohammad Hoesin Palembang in 2020–2021 was 105 cases. From these results, only 50 samples of maternity mothers who had placenta previa with bleeding were taken and met the inclusion criteria because there were medical records that could not be found and there were time constraints in the study and the samples had met the minimum number of research samples.

The frequency distribution of risk factors for the incidence of placenta previa in detail is presented in Table 1. Based on the chi-square test and fisher's exact test on bivariate

analysis, a significant relationship was found between maternal age, parity, cesarean delivery history, and curettage history of placenta previa events. There was no significant association between distances between pregnancies, placental previa history, and fetal sex to placenta previa events (table 2). Based on the binary logistic regression test in multivariate analysis, it was found that the risk factors that most influenced the incidence of placenta previa were cesarean delivery history (OR = 54.751) and curettage history (OR = 20.204) (table 3; table 4).

**Table 1. Frequency Distribution of Risk Factors for Placenta Previa Incidence at RSUP Dr. Mohammad Hoesin Palembang Tahun 2020–2021 (n=100)**

Variable	Frequency	
	n	%
<b>Maternal Age</b>		
At risk (<20 and >35 years old)	24	24,0
No Risk (20–35 years old)	76	76,0
<b>Parity</b>		
At risk (1 and ≥4)	37	37,0
No Risk (2–3)	63	63,0
<b>Distance Between Pregnancies</b>		
At Risk (<2 years)	6	6,0
No Risk (≥2 years old)	94	94,0
<b>History of Placenta Previa</b>		
Yes	3	3,0
No	97	97,0
<b>History of Cesarean Delivery</b>		
Yes	27	27,0
No	73	73,0
<b>History of Curettage</b>		
Yes	15	15,0
No	85	85,0
<b>Assisted Reproductive Technology (ART)</b>		
Yes	0	0,0
No	100	100,0
<b>Multiple Pregnancies</b>		
Yes	0	0,0
No	100	100,0
<b>Fetal Gender</b>		
Male	50	50,0
Female	50	50,0

## 4. Discussion

### 4.1 Relationship of Maternal Age to the Placenta Previa Incidence

The results of the study found that maternal age had a significant relationship with the incidence of placenta previa ( $p = 0.010$ ) with an odds ratio of 4.125 (95% CI = 1.473–11.555).

The results of this study are supported by research conducted by Trianingsih et al. which states that there is a significant relationship between maternal age and placenta previa incidence ( $p = 0.000$ ; OR = 3.845; 95% CI = 2,184–6,770).<sup>13</sup> Age 20 to 35 years is the optimal age for a woman to be able to conceive and give birth safely. At the age of 35, there has been a decrease in physiological and reproductive functions. This causes sclerosis of the small arteries and arterioles of the myometrium so that the blood supply to the endometrium becomes uneven and risks the placenta previa. In this case, the placenta compensates by widening and expanding its surface so that the incoming blood flow can meet its needs.<sup>13</sup>

### 4.2 Relationship of Parity to the Placenta Previa Incidence

The results of the study found that parity had a significant relationship with the incidence of placenta previa ( $p = 0.038$ ) with an odds ratio obtained of 0.381 (95% CI = 0.164–0.882).

The results of this study are in line with the research conducted by Anita, which stated that there was a significant relationship between parity and the incidence of placenta previa ( $p = 0.034$ ; OR = 0.410 (95% CI = 0.191–0.883)).<sup>14</sup> When viewed in terms of maternal mortality, safe parity is parity 2–3. Maternal mortality rates are higher at parity 1 and parity >3.<sup>14</sup> In low parity (primipara), the mother's unpreparedness in the face of the birth of the first child is a contributing factor to the inability of pregnant women to deal with complications

that occur during pregnancy, childbirth, and puerperium.<sup>15</sup> Primipara is associated with a higher incidence of placenta previa.<sup>16</sup> While in mothers with a parity of more than 3, there is an increased frequency of childbirth that reduces the vascularization of the fundus or causes the presence of scarring. Both of these things make placental implantation occur in the lower segment of the uterus.<sup>17</sup> Poor

decidua vascularization due to repeated labor results in the endometrium becoming less fertile and blood flow to the placenta becoming inadequate. This causes the placenta to expand its surface to look for parts with a larger blood supply, namely on the lower segment of the uterus so that it can cover the ostium uteri internum.<sup>14</sup>

**Table 2. Results of Bivariate Analysis of Risk Factors for Placenta Previa Incidence at RSUP Dr. Mohammad Hoesin Palembang Tahun 2020–2021**

Variable	Placenta Previa				p	OR	95% CI
	Case		Control				
	n	%	n	%			
<b>Maternal Age</b>							
At risk (<20 and >35 years old)	18	36,0	6	12,0	0,010*	4,125	1,473–11,555
No Risk (20–35 years old)	32	64,0	44	88,0			
<b>Parity</b>							
At risk (1 and ≥4)	13	26,0	24	48,0	0.038*	0.381	0.164–0.882
No Risk (2–3)	37	74,0	26	52,0			
<b>Distance Between Pregnancies</b>							
At Risk (<2 years)	5	10,0	1	2,0	0,204**	5,444	0.612–48,397
No Risk (≥2 years old)	45	90,0	49	98,0			
<b>History of Placenta Previa</b>							
Yes	3	6,0	0	0,0	0.242**	-	-
No	47	94,0	50	100,0			
<b>History of Cesarean Delivery</b>							
Yes	26	52,0	1	2,0	0.000*	53,083	6,792–
No	24	48,0	49	98,0			414,881
<b>History of Curettage</b>							
Yes	14	28,0	1	2,0	0.001*	19,056	2,395–
No	36	72,0	49	98,0			151,598
<b>Fetal Gender</b>							
Male	21	42,0	29	58,0	0,162*	0.524	0.237–1.160
Female	29	58,0	21	42,0			

#### 4.3 Relationship of Distance Between Pregnancies to the Placenta Previa Incidence

The results of the study found that the distance between pregnancies did not have a significant relationship with the incidence of

placenta previa ( $p = 0.204$ ) with an odds ratio obtained of 5.444 (95% CI = 0.612–48.397).

The results of this study are similar to the research conducted by Umeh et al. which states there is no significant association between the distances between pregnancies

and the incidence of placenta previa ( $p = 0.13$ ; OR = 2.32; 95% CI = 0.78–6.88).<sup>18</sup>

The close birth distance can cause problems during childbirth because the mother's condition has not improved and the ability to meet her nutritional needs is not optimal. A mother takes two to five years to be able to recover physiologically after giving birth and preparing for pregnancy.<sup>19</sup> Short pregnancy distances can contribute to suboptimal healing of the endometrium-myometrial interface, insufficient decidualization, or matrix weakness of the scar itself.<sup>20</sup> The current WHO recommendations

suggest that a woman wait at least 2 years after giving birth.<sup>21</sup>

From the results of the study, there was no significant relationship between the distance between pregnancies and the incidence of placenta previa, probably because patients in the study sample had avoided factors that could support the short distance between pregnancies such as advanced first delivery age, high parity, unplanned pregnancies, not using contraception, and short breastfeeding duration.<sup>22</sup> The incompleteness of the status on the medical record also allows for insignificant results.

**Table 3. Early stage elimination of binary logistic regression analysis**

Variable	B	Exp (B)	p	95% CI	
				Lower	Upper
Maternal Age	1,007	2,737	0.159	0.674	11,121
Parity	-0,674	0.510	0,264	0,156	1,662
Distance Between Pregnancies	0.908	2,479	0.570	0,108	56,737
History of Placenta Previa	18,069	70329864,210	0.999	0,000	0,0
History of Cesarean Delivery	3,431	30,896	0.002	3,573	267,172
History of Curettage	2,320	10,174	0.059	0,912	113,479
Fetal Gender	-0,250	0.779	0.653	0,261	2,321

**Table 4. Final Model of Binary Logistic Regression Analysis**

Variable	B	Exp (B)	p	95% CI	
				Lower	Upper
History of Cesarean Delivery	4,003	54,751	0,000	6,830	438,899
History of Curettage	3,006	20,204	0,006	2,331	175,118

#### 4.4 Relationship of History of Placenta Previa to Placenta Previa Incidence

The results of the study found that the history of placenta previa did not have a significant relationship with the incidence of placenta previa ( $p = 0.242$ ) with an odds ratio in the variable history of placenta previa could not be calculated because in the cross tabulation table, there was a value of 0, namely no patients who had a history of placenta previa in the control group.

The results of this study are in line with the research conducted by King et al. which shows that the history of placenta previa has

no significant relationship to the occurrence of placenta previa, with a p value of 0.99.<sup>23</sup>

In previous pregnancies, the placenta located in the lower segment of the uterus affects the contractions of the uterus and its ability to compress blood vessels. This can lead to the occurrence of bleeding and provoke a large number of intrauterine intraoperative procedures. Such procedures allow the formation of scars on the uterus and pelvic adhesions. The area of scarring has poor vascularity, insufficient tissue oxygenation, and inflammation occurs. It can inhibit reepithelization and decidualization thus

causing abnormalities of placenta-retaining villi and trophoblast invasion. Improper implantation and development of the placenta have been found during subsequent pregnancies in women with a history of placenta previa.<sup>24</sup>

In this study, it was found that there was no significant relationship between the history of placenta previa and the incidence of placenta previa, possibly due to the incompleteness of the status in the medical records so that the data obtained were not too much and not represent the actual situation.

#### **4.5 Relationship of History of Cesarean Delivery to Placenta Previa Incidence**

The results showed that history of cesarean delivery had a significant relationship with the incidence of placenta previa ( $p = 0.000$ ) with an odds ratio obtained of 53.083 (95% CI = 6.792–414.881).

The results of this study are similar to the research conducted by Vida et al. which suggests that there is a significant association between history of cesarean delivery and placental previa incidence ( $p = 0.005$  and OR = 8.603).<sup>25</sup> Uterine scars from cesarean section can cause defects in the endometrium and the occurrence of chronic inflammation. The release of inflammatory factors during inflammation will induce the implantation of the placenta on the lower segment of the uterus. Blood supply to a scar that does not meet the needs of the placenta can stimulate the expansion of the placenta to the lower part of the uterus or even cause the placenta previa centralis. The morphology of the uterine cavity that changes due to the contracture of the scar results in the movement of the fertilized egg closer to the cervix. Scarring of the lower segment of the uterus affects the extension of the uterine isthmus in the third trimester of pregnancy, so the migration of the placenta towards the uterine fundus becomes inhibited and causes the placenta to remain in the lower

segment of the uterus. This results in abnormal placental adhesion and leads to an increase in the incidence of placenta previa centralis.<sup>4,26–28</sup>

The presence of cesarean scars can also alter myometrial contractility, disrupting waves of contractions during implantation. The altered contractility of the myometrium and the disturbed wave of contractions in the endometrium after the delivery of the previous cesarean can lead to a different or lower implantation site, that is, a low-placed placenta or a previa placenta. Placental implantation can also occur in the area or in the cesarean scar.<sup>26,29</sup>

#### **4.6 Relationship of History of Curettage to Placenta Previa Incidence**

The results of the study found that the history of curettage had a significant relationship with the incidence of placenta previa ( $p = 0.001$ ) with an odds ratio obtained of 19.056 (95% CI = 2.395–151.598).

The results of this study are in line with research conducted by Kaul and Mir which states that there is a significant relationship between the history of dilatation and curettage to the occurrence of placenta previa ( $p = 0.000$ ; AOR = 22.6). The presence of endometrial-myometrial interface disorders when curettage is performed, similar to that which occurs during cesarean delivery, can inhibit the process of placental migration.<sup>23</sup> Poor vascularization of the endometrium due to scarring or atrophy caused by previous surgery or infection can lead to decreased development of the lower segments of the uterus as well as inhibit upward migration at the placental site. Endometrial cells located near the scar cannot differentiate properly, causing defects in the implantation mechanism.<sup>30</sup>

#### **4.7 Relationship of Fetal Sex to Placenta Previa Incidence**

The results of the study found that fetal sex did not have a significant relationship with the incidence of placenta previa ( $p = 0.162$ ) with an odds ratio obtained of 0.524 (95% CI = 0.237–1.160).

The results of this study are in line with the research conducted by Zhang et al. which showed that there was no significant association between fetal sex to placental previa incidence ( $p = 0.824$  in mothers with cesarean delivery and  $p = 0.783$  in mothers with vaginal delivery).<sup>24</sup>

This cannot be explained yet but some theories argue that this is due to the larger size of the placenta in the male fetus and the delayed implantation of blastocysts in the male fetus in the lower segment of the uterus.<sup>31</sup> Early and late insemination during the menstrual cycle can cause male conception and also cause changes in the place of implantation. Early insemination allows the embryo to reach the lower segment of the uterus before the endometrial layer is ready for implantation. In late insemination, the ovum may be in the lower segment of the uterus when fertilized, resulting in lower uterine implantation in both cases. In addition, there are major differences in transplacental hormones and immunological status between pregnant women and male and female fetuses. These hormonal and immunological differences of the fetus are associated with the development of certain complications in pregnancy.<sup>30</sup>

In this study, it was found that there was no significant relationship between the sex of the male fetus and the occurrence of placenta previa because the distribution of data was very even, namely the number of male sexes was proportional to that of women. In addition, similar research on this subject is also still being carried out quite a bit, especially in Indonesia.

## 5. Conclusion

Based on the results of the study, it can be concluded that cesarean delivery history and curettage history are the risk factors that most influence the incidence of placenta previa at RSUP Dr. Mohammad Hoesin Palembang in 2020–2021. Therefore, medical personnel is expected to provide education to the public to maintain pregnancy distance by using contraceptives and suggest having only two children following government programs to prevent MMR. In addition, it is also hoped that the public will be able to add insight and increase awareness about the risk factors of placenta previa and improve compliance with regular ANC examinations to early detect placenta previa and carry out treatment earlier to avoid further complications in the mother or fetus.

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