

**RESEARCH ARTICLE**

The Relationship Between Parity, History Of Antenatal Care (ANC), Pregnancy Complications, Estimated Fetal Weight and Fetal Presentation To The Selection Of Cesarean Section Action

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Submitted: September 22, 2025;

Accepted: January 20, 2026

Published: February 02, 2026

Doi : <https://doi.org/10.25077/aoj.10.1.70-87.2026>

Abstract

Introduction: There is an increase in caesarean sections trend globally. Caesarean section is generally performed to assist deliveries that cannot be carried out normally, but this also has a significant impact on both maternal and child health, as well as the economic burden so it is necessary to evaluate the factors that influence decision for caesarean section, to determine the relationship between parity, antenatal care

Method: This study is an analytical observational study with a case control design conducted in July 2024 using medical record data of pregnant women who underwent caesarean section or vaginal delivery at the Pariaman City Regional General Hospital in the urban area and Sungai Dareh Regional Hospital at Dharmasraya in rural areas. The sample for this study were pregnant women who chose caesarean section and women after vaginal delivery who met the inclusion and exclusion criteria

Results: In this study there were 354 pregnant women who underwent CS (n=177) and vaginal delivery (n=177). Bivariate analysis showed a relationship between parity (OR: 1.64 [95% CI: 1.07-2.52]; p=0.023), history of ANC (OR: 1.64 [95% CI: 1.06-2, 55]; p=0.026), pregnancy complications (OR:3.16 [95% CI: 1.98-5.03]; p=0.000), fetal presentation (OR: 2.02 [95% CI: 1.26-3.24]; p=0.003) and estimated fetal weight (OR: 1.98 [95% CI: 1.19-3.30]; p= 0.008) with the decision making of caesarean section. Multivariate analysis showed that the most influencing factors on the decision making of caesarean section were pregnancy complications (OR 4.35 [95% CI: 2.58 – 7.34]; p= 0.000), fetal presentation (OR 3.21 [95% CI : 1.85 – 5.55]; p=0.000) and parity (OR 1.59 [95% CI: 1.01 – 2.52]; p=0.044).

Conclusion: The factors that most influence the decision making of caesarean section are pregnancy complications, fetal presentation, and parity.

Keywords: Parity, ANC, pregnancy complications, fetal weight, fetal presentation, cesarean section.

INTRODUCTION

Cesarean section (SC) is a surgical procedure to give birth to one or more babies by making an incision in the anterior abdominal wall of a pregnant woman by opening the abdomen (laparotomy) and the mother's uterus (hysterotomy). This definition does not apply to fetal delivery from the abdominal cavity in cases of uterine rupture or abdominal pregnancy.¹ Cesarean section is performed on the basis of medical indications, such as placenta previa, abnormal presentation in the fetus, as well as other indications that can endanger the life of the mother and fetus. Other indications such as stalled delivery, abnormal fetal presentation, excessive fetal size, inconclusive fetal heartbeat, increased maternal age and previous cesarean delivery history are considered for delivery by cesarean section.²

According to the *World Health Organization* (WHO), the average cesarean section rate worldwide ranges from 5% to 15% per 1,000 births. Countries with a percentage below 5% indicate that cesarean section procedures *are underused*, while those with a percentage above 15% indicate *overuse*.³ Countries with excessive and unindicated cesarean section rates, the largest are from Brazil and the Dominican Republic, and the lowest are in Nigeria and Tanzania.⁴ The number of cesarean section deliveries in the world in 2018 reached 21.1%. The increase is projected to reach 28.5% by 2030. The rate of cesarean section in the Southeast Asian country increased from 13% to 19%.⁵

In Indonesia, the 2018 Basic Health Research (RISKESDAS) showed that 17.6% of deliveries were by cesarean section.⁶ In 2021, there was an increase in the cesarean section delivery rate in Indonesia to 19.8%.⁷ Provinces with the highest cesarean section rate in the DKI Jakarta area at 31.3% and the lowest in Papua at 6.7%. In the last decade, there has been an increase in cesarean section deliveries from 7% in 2007 to 17.02% in 2017.⁸

In West Sumatra, the cesarean section delivery rate is higher than national data, which was 23.64% in 2018.⁹ Meanwhile, at Dr. M. Djamil Padang Hospital, there are 182 deliveries (2015), 205 deliveries (2016), 209 deliveries (2017), 232 deliveries (2018) and 247 deliveries in 2019. Meanwhile, the prevalence of cesarean section at Dr. M. Djamil Padang Hospital in 2017 was 52% and in 2018 it increased to 62.7%.¹⁰

Based on the results of the recapitulation of hospital data in West Sumatra in 2023, it was found that Pariaman City Hospital in urban areas and Sungai Dareh Hospital in Dharmasraya district in rural areas have the highest number of cesarean section occurrences compared to hospitals in other areas in West Sumatra, which amounted to 641 cesarean section deliveries out of a total of 933 cesarean sections at Pariaman City Hospital during 2023 and amounted to 526 cesarean section deliveries of a total of 769 deliveries at Sungai Dareh Hospital, Dharmasraya regency in 2023.¹¹

Residences are divided into 2, namely rural and urban. Rural is a rural or an administrative area at the village/sub-district level that has not met the criteria for classification of urban areas in terms of population density, percentage of households, a number of urban facilities such as formal education facilities and public health facilities.¹² The classification of urban and rural areas is carried out by the Central Statistics Agency for development planning purposes. Difficult geographical

conditions in rural areas often pose an obstacle for people to utilize existing service facilities, including health facilities. SDKI data (2012) shows that people in rural areas face greater problems with distance to health facilities than people in urban areas.¹³

Parity is the number of live births a woman has had, where repeated births will have a risk of pregnancy.¹⁴ A high level of parity has a low level of maternal health so there is a high risk of having high morbidity and mortality during the delivery process.¹⁵

The frequency of *antenatal care* (ANC) shows the concern of pregnant women in caring for pregnancy and paying attention to their own health and the health of the baby they are carrying during pregnancy, so that they can prepare for delivery and face it properly and without any pregnancy complications. A complete ANC visit can detect pregnancy pathologies so that it can optimize safe and healthy pregnancy and delivery. Mothers with a frequency of ANC < 4 times had a 22.2 times risk of having a cesarean section delivery compared to mothers who checked themselves 4 or more times during pregnancy. A study has explained that there is a relationship between a woman's ANC history and the selection of the cesarean section delivery process. This is related to the existence of pregnancy complications that can affect the decision to perform childbirth by the caesarean section method.¹⁶

Some serious or high-risk pregnancy complications may be an indication to perform a *cesarean section* to reduce the risk to the mother and fetus.¹⁷ Research by Nisma et al (2022) explained that there is a relationship between pregnancy complications experienced by mothers who give birth and *sectio caesarea*. To avoid a *cesarean section*, early prevention of pregnancy complications is essential. If the fetus has significant growth impairment or does not develop well enough in the womb, a *cesarean section* may be an option to gain immediate access to medical care and minimize the risk to the fetus, which can be detected through ANC.¹⁸

Estimates of fetal weight determined at gestational age are useful for determining management at the end of pregnancy, for example, indications of cesarean section in suspected cases of macrosomia in women with gestational diabetes. On the other hand, a slow-growing fetus should be identified while it is still *intrauterine* so that clinicians can be more rigorous in monitoring and planning their delivery methods to reduce the risk of perinatal death. Using accurate prediction methods, babies with extreme weight estimates can be more or less known and some precautions can be taken to address the problem before delivery. Childbirth abnormalities and neonatal complications are related to extreme birth weight.¹⁸

Fetal presentation refers to the part of the fetus's body that is located in the birth canal and will come out first during delivery. Fetal presentation is related to the indication of the fetus at the time of delivery, which affects the chosen delivery process. When the presentation of the fetus is not suitable, it will affect the selection of the delivery process, one of which is *Sectio Caesarea*.¹⁹ Research by Salsabila et al (2023) explained that there is a relationship between the baby's location abnormality and cesarean section action.²⁰

Based on the above explanation, it can be seen that there are various factors that can influence decision-making in the selection of cesarean section action in maternal delivery. So in this

study, the researcher will look at the relationship between parity, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation to the choice of cesarean section. By paying attention to the above background, the research problem was formulated, namely "Is there a relationship between parity, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation to the selection of cesarean section?".

METHODS

Research Design

This research is an observational analytical research with a case-control design. This type of observational study is commonly used to look at factors associated with disease or outcomes. The researchers then examined historical factors to determine whether certain exposures were more prevalent in the case group than in the control group. If exposure is more common in the case group than in the control group, researchers can hypothesize that the exposure may be related to the desired outcome.⁵⁶

Place and Time of Research

This research was conducted at the Regional General Hospital (RSUD) of Pariaman City, as an urban area, and Sungai Dareh Dharmasraya Hospital, as a rural area, in the West Sumatra region. The research was conducted from 1 June 2024 to 30 November 2024.

Population and Sample

The study population in this study is women who undergo cesarean section as a method of delivery and women who undergo vaginal postpartum *care* at the Regional General Hospital (RSUD) of Pariaman City in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region. The research sample (n) is a collection of research subjects (units of analysis) taken from the study population (N) where measurements were taken. The sample in this study is a collection of postpartum women who underwent cesarean section surgery at the Regional General Hospital (RSUD) of Pariaman City in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region according to inclusion and exclusion criteria. As a comparison group, it is a collection of postpartum women who perform *antenatal care* at the Regional General Hospital (RSUD) of Pariaman City in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region according to inclusion and exclusion criteria.

Sampling Techniques

Sampling techniques affect the accuracy or validity of a study. In this study, *the purposive sampling technique* is used, which is a sampling technique where the researcher determines the sample by determining special characteristics that are in accordance with the research objectives so that it is expected to answer the research problem. The instrument in data collection used medical record data of maternity mothers at the Regional General Hospital (RSUD) of Pariaman City in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region.

Research Subject Criteria

The inclusion criteria for this research subject are as follows:

- a) Complete medical record data for each variable studied in the conceptual framework.

The exclusion criteria for this research subject are as follows:

- a) *Intrauterine fetal death* (IUFD) or neonatal death.
- b) Pregnant women with uterine deformities: excluded if an ultrasound examination finds anatomical abnormalities of the uterus.

Large Sample

$$n1 = n2 = \frac{\left(\left(Z_{1-\alpha/2} \sqrt{2\bar{P}(1-\bar{P})} + Z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right)^2 \right)}{(P_1 - P_2)^2}$$

Information:

- $n1$: Number of samples of the cesarean section group.
- $n2$: The number of samples of the non-cesarean section.
- Z_{α} : Z value at Confidence Interval (*Confidence Interval*/CI) 95% i.e. 1.96.
- Z_{β} : Z value on Test Strength (*Power*) 80% i.e. 0.84.
- P_1 : Proportion of at-risk groups in cesarean section = 0.39 (Sihombing et al., (2017)
- P_2 : Proportion of non-at-risk groups in cesarean section = 0.61 (Sihombing et al., (2017)
- $\bar{P}$: Average proportion of P_1 and P_2 = 0.50
- Deff : Design effect = 2 for the area per district.

So the sample size of this study is:

$$n1 = n2 = \frac{\left(1,96 \sqrt{2 \times 0,50 (1 - 0,50)} + 0,84 \sqrt{0,39 (1 - 0,39) + 0,61 (1 - 0,61)} \right)^2}{(0,39 - 0,61)^2}$$

$n = 81/Group$

The results were corrected with deff because the sampling was *clustered random sampling*, so the number of samples became $81 \times 2 = 162$ respondents. The minimum sample size obtained from this study was 162×2 groups = 324 respondents. However, to anticipate *drop out*, the sample size was added by 10%, which was 32 female respondents, so a sample of 354 postpartum women (177 cesarean sections and 177 vaginal deliveries) was needed. The study used a *case control* study design with a ratio of 1:1. The minimum sample results obtained were 177 vaginal deliveries and 177 deliveries with cesarean sections.

Based on patient recapitulation data at Pariaman City Hospital in 2023, the total number of patients undergoing cesarean section at Pariaman City Hospital during 2023 is 641 patients, and the total number of patients undergoing vaginal delivery at Pariaman City Hospital during 2023 is 292 patients.

Based on patient recapitulation data at Sungai Dareh Dharmasraya Hospital in 2023, the total number of patients undergoing cesarean section at Sungai Dareh Dharmasraya Hospital during 2023 is 526 patients and the total number of patients undergoing vaginal delivery at Sungai Dareh Dharmasraya Hospital during 2023 is 243 patients.

The number of patient samples needed in patients undergoing cesarean section at Pariaman

City Hospital is $x 177 = x 177 = 97$ patients, while the number of patient samples needed in patients undergoing vaginal delivery at Pariaman City Hospital is $x 177 \times 177 = 97$ patients.

$$n = \frac{641}{(641 + 526)} \frac{641}{1167} n = \frac{292}{(292 + 243)} = \frac{641}{535}$$

The number of patient samples needed in patients undergoing cesarean section at Sungai Dareh Dharmasraya Hospital is $x 177 \times 177 = 80$ patients, while the number of patient samples needed in patients undergoing vaginal delivery at Sungai Dareh Dharmasraya Hospital is $x 177 = x 177 = 80$ patients.

$$n = \frac{526}{(641 + 526)} = \frac{526}{1167} n = \frac{243}{(292 + 243)} \frac{243}{535}$$

Data Collection

Data collection was carried out by means of research instruments, namely medical record data of maternity mothers at the Regional General Hospital (RSUD) of Pariaman City in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region for the period of 1 January 2023 – 31 December 2023 which are recapd in a data table made by the researcher himself, according to the variables to be studied in the conceptual framework.

Data Type

The data in this study consisted of secondary data, which was applied by looking at the medical records of patients after cesarean section delivery and postpartum vaginal delivery as a comparison.

How Data Is Collected

Data collection was carried out by recording medical record documents and registers by researchers to obtain data on maternal parity, ANC history, pregnancy complications, estimated fetal weight, and fetal presentation on medical records at the Pariaman City Regional General Hospital (RSUD) in urban areas and Sungai Dareh Dharmasraya Hospital in rural areas in the West Sumatra region in 2023.

Data Analysis

a) Univariate Analysis

Univariate analysis is used to describe the relationship between the independent and dependent variables of the study. Independent variables use a ratio scale that includes numerical data. So that in the univariate analysis, the result is the mean value and standard deviation. Meanwhile, the dependent variable uses an ordinal scale of measurement, which includes categorical data. So that in the univariate analysis, the result is the frequency distribution and proportion of each category.

b) Bivariate Analysis

Bivariate analysis was performed to see a significant relationship between two variables, namely parity, ANC history, pregnancy complications, estimated fetal weight and fetal presentation with the selection of cesarean section. The analysis to be used at this stage also depends on the type of data. In this study, all the data to be analyzed are categorical, so the test to be used is the chi-square test with a 95% confidence level. The decision taken from this analysis test is by looking at the value of p and *Odds Ratio* (OR) of the relationship between the variables. The Odds Ratio is used to determine how much influence independent variables (parity, ANC history, pregnancy complications, estimated fetal weight and fetal presentation) are influenced by dependent variables (selection of cesarean section).

c) Multivariate Analysis

After the bivariate test was carried out using the *Chi-square*, all independent variables including parity, ANC history, pregnancy complications, estimated fetal weight and fetal presentation had a significant relationship with the dependent variable, namely the selection of cesarean section. All independent variables that have a significant relationship will then be multivariate analysis using the *binary logistic regression*. In this case, independent variables tested simultaneously (multivariate) (parity, ANC history, pregnancy complications, fetal presentation, and estimated fetal weight) were analyzed to see their effect on the dependent variables independently after considering the other variables.

RESULT

1. Respondent Characteristics

Table 1. Respondent Characteristics

Variable (n=354)	n	%
Age		
• <25 years and >35 years old	153	43,2
• 25-35 years old	201	56,8
Education		
• Elementary School	313	88,4
• College	41	11,6
Work		
• Not Working	294	83,1
• Work	60	16,9
Residence		
• Urban	194	54,8
• Rural	160	45,2

In this study, there were 43.2% of pregnant women aged <25 years and >35 years and 56.8% aged 25-35 years. Most of the respondents had a final education in elementary and high school (88.4%) with a small percentage completing college (11.6%). As many as 83.1% of pregnant women

in this study did not work and 16.9% had jobs. Respondents in this study came from urban (54.8%) and rural (45.2%) areas with almost the same proportion.

2. Parity picture, ANC history, pregnancy complications, estimated fetal weight and fetal presentation at vaginal delivery and SC

Table 1 Parity picture, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation in postpartum pregnant women

Variable (n=354)	n=177	%
Parity		
• Risky (Nullipara or ≥ 4 times)	61	35,5
• No Risk (2-3 times)	116	65,5
History of ANC		
• ANC < 6x	53	29,9
• ANC $\geq 6x$	124	70,1
Pregnancy Complications		
• Exist	95	53,7
• Not	82	46,3
Fetal Presentation		
• Abnormal	38	21,5
• Usual	139	78,5
Fetal Weight Assessment		
• Abnormal Fetal Weight ≤ 2500 gr or ≥ 4000 gr	30	16,9
• Normal Fetal Weight 2500 gr to 4000 gr	147	83,1

Based on Table 2, it was found that 65.5% of pregnant women who gave birth vaginally had parity 2-3 times and 35.5% had parity of 1 or ≥ 4 times. Most pregnant women who gave birth vaginally (70.1%) had ANC $\geq 6x$ with 29.9% having ANC <6x. In this study, as many as 53.7% of pregnant women who gave birth vaginally had pregnancy complications and 46.3% had no complications. Most pregnant women with vaginal delivery (78.5%) had a normal fetal presentation and only 21.5% had an abnormal fetal presentation. Most pregnant women (83.1%) have normal fetal weight (2500 gr to 4000 gr) and only 16.9% have abnormal fetal weight (≤ 2500 gr or ≥ 4000 gr).

Table 2 Parity picture, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation of pregnant women in SC delivery

Variable (n=354)	n	%
Parity		
• Risky (Nullipara or ≥ 4 times)	82	46,3
• No Risk (2-3 times)	95	53,7
History of ANC		
• ANC < 6x	73	41,2
• ANC $\geq 6x$	104	58,8
Pregnancy Complications		
• Exist	139	78,5
• Not	38	21,5
Fetal Presentation		
• Abnormal	63	35,6
• Usual	114	64,4
Fetal Weight Assessment		
• Abnormal Fetal Weight ≤ 2500 gr or ≥ 4000 gr	51	28,8
• Normal Fetal Weight 2500 gr to 4000 gr	126	71,2

Based on Table 3, it was found that 53.7% of pregnant women with SC childbirth had parity 2-3 times and 46.3% had parity of 1 or ≥ 4 times. As many as 58.8% of pregnant women with SC delivery performed ANC $\geq 6x$. In this study, most (78.5%) pregnant women with SC childbirth had pregnancy complications. As many as 35.6% of pregnant women had abnormal fetal presentation and as many as 64.4%. Most pregnant women (71.2%) had normal fetal weight (2500 gr to 4000 gr) and 28.8% had abnormal fetal weight (≤ 2500 gr or ≥ 4000 gr).

3. Parity relationship, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation to the selection of cesarean section action

Table 3 The relationship of parity with the selection of cesarean section actions

Variable	Caesarean Section		Usual		OR	95% CI		+P value
	n	%	n	%		Lower	Upper	
Parity								
• Risky (Nullipara or ≥ 4 times)	82	46,3	61	34,4	1,64	1,07	2,52	0,023
• No Risk (1-3 times)	95	53,7	116	65,5				

Ket: OR: Odds Ratio; CI: Confidence interval

Table 4 shows that there is a relationship between parity (OR: 1.64 [95% CI: 1.07-2.52]; $p=0.023$) and the selection of cesarean sections. Pregnant women with Nullipara parity or ≥ 4 times have a 1.6 times risk of SC surgery.

Table 4 The relationship between the ANC's history and the selection of cesarean section actions

Variable	Caesarean Section		Usual		OR	95% CI		+P value
	n	%	n	%		Lower	Upper	
History of ANC								
• ANC < 6x	73	41,2	53	29,9	1,64	1,06	2,55	0,026
• ANC $\geq 6x$	104	58,8	124	70,1				

Ket: OR: Odds Ratio; CI: Confidence interval

Table 5 shows that there is a relationship between ANC history (OR: 1.64 [95% CI: 1.06-2.55]; $p=0.026$) and the selection of cesarean sections. Pregnant women with a history of poor ANC (<6x) have a 1.6 times greater risk of SC surgery.

Table 5 The relationship between pregnancy complications and the selection of cesarean section

Variable	Caesarean Section		Usual		OR	95% CI		+P value
	n	%	n	%		Lower	Upper	
Pregnancy Complications								
• Exist	13 9	78,5	95	53,7	3,16	1,98	5,03	0,000
• Not	38	21,5	82	46,3				

Ket: OR: Odds Ratio; CI: Confidence interval

Table 6 shows that there is a relationship between pregnancy complications (OR:3.16 [95% CI: 1.98-5.03]; $p=0.000$) with the selection of cesarean sections. Pregnant women who have pregnancy complications have a 3.16 times risk of having SC performed.

Table 6 The relationship between fetal presentation and the selection of cesarean section action

Variable	Caesarean Section		Usual		OR	95% CI		+P value
	n	%	n	%		Lower	Upper	
Fetal Presentation								
• Abnormal	63	35,6	38	21,5	2,02	1,26	3,24	0,003
• Usual	114	64,4	139	78,5				

Ket: OR: Odds Ratio; CI: Confidence interval

Table 7 shows that there is a relationship between fetal presentation (OR:2.02 [95% CI: 1.26-3.24]; p=0.003) with the selection of cesarean sections. Pregnant women with abnormal fetal presentation have a 2.02 times greater risk of SC surgery.

Table 7 The relationship between the estimated weight of the fetus and the selection of cesarean section actions

Variable	Caesarean Section		Usual		OR	95% CI		+P value
	n	%	n	%		Lower	Upper	
Fetal Weight Assessment								
• Abnormal Fetal Weight ≤ 2500 gr or ≥ 4000 gr	51	28,8	30	16,9	1,98	1,19	3,30	0,008
• Normal Fetal Weight 2500 gr to 4000 gr	126	71,2	147	83,1				

Ket: OR: Odds Ratio; CI: Confidence interval

Table 8 shows that there is a relationship between estimated fetal weight (OR: 1.98 [95% CI: 1.19-3.30]; p=0.008) with the selection of cesarean sections. Pregnant women with an abnormal estimated fetal weight have a 1.98 times risk of SC surgery.

4. The most influential factors in the selection of cesarean section actions

Table 8 Multivariate analysis of the factors most influential on the selection of cesarean section action

Characteristic	p value	OR	95% Confidence Interval	
			Lower	Upper
Parity	0,044*	1,59	1,01	2,52
History of ANC	0,320	1,27	0,79	2,05
Pregnancy complications	0,000*	4,35	2,58	7,34
Fetal Presentation	0,000*	3,21	1,85	5,55
Fetal Weight Assessment	0,732	1,11	0,62	1,97

**Logistic regression between risk factors (parity, history of ANC, pregnancy complications, fetal presentation, and estimated fetal weight) with the selection of cesarean section action*

Bivariate tests using Chi square found that all factors (parity, history of ANC, pregnancy complications, fetal presentation and estimated fetal weight) had a significant influence on the selection of cesarean sections, therefore multivariate tests were performed on all variables to determine the variables that had the greatest influence on the selection of cesarean sections.

Table 9 shows the results of a multivariate test using logistic regression and only three

variables have a significant influence on the selection of cesarean section with the strongest influence having pregnancy complications (OR 4.35 [95% CI: 2.58 – 7.34]; *p value* 0.000) followed by fetal presentation (OR 3.21 [95% CI: 1.85 – 5.55]; *p value* 0.000) and finally parity (OR 1.59 [95% CI: 1.01 – 2.52]; *p value* 0.044).

Table 10 Multivariate analysis of the most influential factors among the three determinants of cesarean section action

Characteristic	<i>p value</i>	Exp(B)	95% Confidence Interval	
			Lower	Upper
Parity	0,044*	1,599	1,013	2,525
Pregnancy complications	0,000*	4,358	2,585	7,349
Fetal Presentation	0,000*	3,212	1,857	5,555

**Logistic regression between risk factors (pregnancy complications, fetal presentation, and parity) with the selection of cesarean section action*

After three variables were found that had a significant influence on the selection of cesarean sections, a multivariate test was conducted using logistic regression, and pregnancy complications had the strongest influence (Exp[B]: 4.358; *p value* 0.000)

DISCUSSION

A. Respondent Characteristics

In this study, there were 43.2% of pregnant women aged <25 years and >35 years. Risky gestational age is associated with higher pregnancy complications in both mother and baby. Research by Hochler, et al (2023) found that cesarean birth rates increase with the age of mothers, with rates ranging from 6.7% in the 25-30 age group, continuing to increase from 13.5% to 19.9% in the 31 and 42 age groups, to exceed 20% in the maternal age group ≥ 43 years. In addition, the rate of hospitalization in the NICU increased from 2.7% in the reproductive normal age group to 6% in the maternity mother aged 45-46 years.⁵⁷ Another study by Putri, et al (2023) found that advanced age in mothers is related to low birth weight.⁵⁸

Most pregnant women have the last elementary and high school education (88.4%). Research by Salsabila, et al (2021) in Surabaya found that low maternal education levels are associated with a high incidence of low birth weight. This is due to the lack of knowledge and access of mothers to good nutrition during pregnancy which is also associated with economic factors.⁵⁹

As many as 83.1% of pregnant women in this study did not work. The relationship between women's employment and employment status and pregnancy outcomes has been reported in several studies. Research by Kim, et al (2023) states that working during pregnancy is associated with a higher risk of miscarriage or *stillbirth*, so the work environment needs to be conditioned during pregnancy to avoid unwanted events.⁶⁰

In this study, the proportion of patients living in rural and urban areas was almost the same

as the number of vaginal and SC deliveries so that regional factors could be avoided from the cause of SC method selection bias. Demographic data in Indonesia from 1998 to 2017 found that in 2017, the SC rate was twice as high in urban areas as in rural areas. This is influenced by the improvement of socioeconomic status and also the health system.⁵⁴

Vaginal delivery is safest for both the fetus and the mother when the baby is born at full term at 37 to 42 weeks gestation. Vaginal delivery is preferable given that the morbidity and mortality associated with cesarean delivery have increased over time.⁶¹ In this study, most pregnant women who gave birth vaginally had parity of 1-3 times. These results are similar to a study by Bradaschia, et al (2024) found that as many as 63% of mothers who give birth vaginally have parity of 2-3.⁶²

In the vaginal delivery group, most mothers performed ANC $\geq 6x$. High-quality antenatal services are considered one of the most important and widespread tools in healthcare to enhance a positive pregnancy experience and prevent maternal and newborn pain and death worldwide.⁴⁶

Most pregnant women who have vaginal delivery have a normal fetal presentation. However, there is a small percentage of pregnant women with abnormal fetal presentation. Poddar, et al (2024) found that vaginal delivery for a single full-term breech is still reasonable in selected patients in a health center with optimal equipment, in the hands of an experienced Obstetrician.⁶³

The percentage of respondents with pregnancy complications and no pregnancy complications was almost the same in vaginal delivery. A study by Coviello, et al (2019) on 914 pregnancies with preeclampsia found that as many as 214 patients successfully underwent vaginal delivery with induction where this success increased as the gestational age increased.⁶⁴

Most women of vaginal delivery have a normal fetal weight estimate. Research by Bradaschia, et al (2024) found the average weight of a vaginally born newborn was 3.18 kg, with 90.16% weighing more than 2500g.⁶²

In SC delivery, the percentage of respondents with parity of 1-3 times and nullipara and ≥ 4 times is almost the same. Women with high parity are more likely to experience adverse effects on both mother and baby, such as pregnancy complications, cesarean sections, and infant mortality in newborns. In addition, women with high parity were shown to be less satisfied with life and had a worse quality of life when compared to women with low parity.⁶⁴

The percentage of ANC $\geq 6x$ and $<6x$ is almost the same in mothers who give birth by SC. It has been previously stated that antenatal services are beneficial in preventing maternal and newborn pain and death around the world. Irregularities in pregnancy control can lead to delays in diagnosis and therapy of pregnancy complications found.⁴⁶

Most pregnant women with SC childbirth have pregnancy complications. Patients referred for hospital delivery generally have pregnancy complications so it is necessary to monitor at level two or three health facilities. Research by Worku et al (2023) in Ethiopia found that the absence of antenatal bleeding and the absence of headaches in pregnant women were 5.28 times and 2.45 times more likely to give birth in a midwife's home than in a hospital.⁶⁵

In this study, more than one-third of patients in the SC delivery group had abnormal fetal presentation. Other studies show the rate of SC in pregnancies with fetal malpresentation ranges from 27-87%.⁶⁶ In this study, about a quarter of patients had an abnormal fetal weight estimate. The incidence of macrosomia in the study based on 2014-2019 data in Brazil was 3.3%, of which as many as 65% of patients had SC delivery.⁶⁷

B. Parity relationship, history of ANC, pregnancy complications, estimated fetal weight and fetal presentation to the selection of cesarean section action

In this study, it was found that pregnant women with nulliparous parity and parity ≥ 4 times were 1.6 times more likely to have SC action compared to parity 1-3. These results align with previous research. A study by Nantume et al (2023) found a very high proportion of SC at parity 1-2 compared to vaginal delivery, with a proportional ratio of 70% vs. 30%.⁶⁷ Research by Giang, et al (2022) in rural areas of Vietnam also found that *first-time mothers* are a risk factor for SC childbirth.⁶⁸ The tendency of SC to parity at risk (nullipara and >4 times) is related to frequent maternal morbidities related to parity such as preeclampsia, placenta previa and prolonged labor.⁶⁹

In this study, pregnant women with a history of poor quality ANC ($<6x$) were 1.6 times more likely to have SC performed than those with quality ANC. The opposite was found by Fabbro, et al (2022) where SC was 19% more common in pregnant women with adequate ANC ($>6x$) who had a history of ANC $>6x$ increased SC by 47%. In further interviews, respondents in the study stated that most of the ANCs were carried out briefly and there was a lack of empathy from health workers when answering pregnant women's fears of vaginal delivery regarding pain during childbirth and also the condition of the baby if vaginal delivery was carried out, so most mothers decided to perform SC delivery for the safety of the baby and avoid pain during childbirth.⁴⁶

This suggests that, although the ANC is related to the SC's considerations, there are other factors that are more influential in shaping the SC's decision regarding its delivery. This is shown from the OR for ANC being the smallest among the other determinants. Additionally, a qualified ANC must be able to provide patients with knowledge and guidance on selecting the most suitable method of delivery based on their individual condition.⁴⁶

This study found that pregnant women who had pregnancy complications were 3.16 times more likely to have SC compared to those who did not have pregnancy complications. In a study by Alshammari et al (2022), it was also found that pregnancy complications such as fetal and placental insufficiency are significant indications of SC action in all age groups.⁵⁶ Nantume, et al (2023) also found in their research that pregnant women with pregnancy complications such as fetal emergency and preeclampsia/eclampsia, all (100%) had SC delivery.⁶⁷

Pregnant women with abnormal fetal presentation have a 2.02 times higher risk of SC compared to normal fetal presentation. A study by Nantume et al. (2023) found a similar result, where abnormal presentations are more likely to be performed in SC delivery than vaginal delivery (97% vs. 3%).⁶⁷ Another study by Idris et al (2022) also found that the 3 main indications of cesarean section were malposition (26.3%), long and stuck labor (21.2%), and malpresentation (14.4%).⁷⁰

In this study, pregnant women with an abnormal fetal weight estimate were 1.98 times at risk of SC compared to normal fetal weight estimates. A study by Nedberg et al (2020) on primipara women found that pregnant women with an estimated fetal weight of <2500 grams and ≥ 4000 grams increased the risk of having SC with an OR of 1.46 for an estimated fetal weight of <2500 grams and an OR of 2.32 for an estimated fetal weight ≥ 4000 grams.⁷¹

Nedberg stated that this is because national guidelines in Norway recommend planned SC for babies with macrosomia (weight ≥ 4500 g) or in unplanned SC conditions, vaginal delivery is not advanced due to the disproportion of the pelvic head.⁷¹

A study by Nantume et al (2023) also found that, in addition to previous SC cases, stuck labor due to pelvic head dispropose was the second most common indication (114/649) for SC delivery.¹¹⁹ Another study by Giang et al (2022) in 1812 pregnant women in Vietnam also found that the estimated weight of the fetus had an effect on the decision to carry out an SC delivery with an OR of 1.31.⁶⁸

C. The most influential factors in the selection of cesarean section actions

In this study, only three variables were found that had a significant influence on the selection of cesarean section action after the multivariate test, with the strongest influence on pregnancy complications, with a risk of 4.35 times, followed by fetal presentation, with a risk of 3.21 times, and finally parity, with a risk of 1.59 times.

Pregnancy complications obtained the greatest OR among other variables, which makes pregnancy complications a variable with a strong influence on the decision to perform SC. This is proven in several studies, such as those explained by Kaur et al and Hammad et al that complications in pregnancy, such as fetal severity, hypertension in pregnancy, oligohydramnion, KPD, and other pregnancy complications, are factors in the occurrence of SC in pregnant women with Nullipara parity and ≥ 4 .⁶⁹

Research by Bam et al (2021) on 163 women with postpartum SC stated that the second factor that most influenced the decision to have an elective SC was the risk of pregnancy in the fetus, such as fetal emergency, apart from the support of the husband or family.⁷³ Another study by Irwinda et al (2021) on 603 postpartum patients stated that history of SC/uterine surgery and pregnancy complications (preeclampsia/eclampsia, gestational DM, IUGR, placenta previa, and abruptio placenta) were the most powerful risk factors in influencing cesarean section action with OR of 8.34 and 5.61, respectively.⁷³

The second factor that most affects the decision of caesarean section is malpresentation with a risk of 3.21 times. Previous research by Mahindra et al (2020) on 47 pregnant women in East Java found that fetal malpresentation is the second risk factor after ex-SC in influencing the decision of the section with an OR of 8.25.⁷⁴

The third factor is parity. SC childbirth occurs in nullipara, and ≥ 4 times it occurs due to pregnancy complications that are more common in this group. A study by Kau et al found that the rate of emergency caesarean section (65.51%) was higher in primiparity. This is because primiparae

have a higher tendency to experience Hypertension Due to Pregnancy (15.38%), intrauterine growth retardation (19.23%), preterm delivery (9.61%), fetal emergency (19.23%), and Oligohydramnion (17.30%).⁶⁷ Meanwhile, in patients with parity ≥ 5 times, Hammad, et al (2023) found that indications the most common were malpresentation 22.1%, fetal emergency 15%, stage 1 elongated 13.4%, stage two elongated 12.4%, antepartum bleeding 11.5%, maternal demand 8%, premature rupture amniotic membrane 7.1%, eclampsia 6.2%, and delivery failure with an instrument 4.4%.⁶⁹

CONCLUSION

Most pregnant women are 25-35 years old, have the last elementary and high school education, and are not working. Most mothers who give birth vaginally have parity 1-3 times, perform $\geq$ ANC 6x, have no pregnancy complications, have normal fetal presentation, and normal fetal weight estimates. Meanwhile, in SC delivery, the number of respondents with nullipara and ≥ 4 times and ANC < 6 times was almost 50%; most had pregnancy complications, with the percentage of abnormal fetuses present in more than one-third of patients and abnormal fetal weight of more than a quarter of patients. There was an association between parity, history of ANC, pregnancy complications, fetal presentation, and estimated fetal weight with the selection of cesarean sections. The most influential factor in the selection of a cesarean section is pregnancy complications.

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