ORIGINAL RESEARCH

FACTORS THAT INFLUENCE CESAREAN SECTION DELIVERIES IN INDONESIA

Faktor-Faktor yang Berhubungan dengan Persalinan Bedah Sesar di Indonesia Tahun 2017

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ABSTRACT

Background: The percentage of cesarean deliveries in Indonesia increased from 12% in 2012 to 17% in 2017. **Purpose:** The aim of this study was to determine the factors that influenced the rate of cesarean deliveries in Indonesia in 2017. **Methods:** The study used a cross-sectional design, gathering secondary data from the Indonesian Health Demographic Survey (IDHS) in 2017. The sample included mothers who gave birth to their last child in Indonesia in the last five years; a survey was conducted after respondents with missing data were excluded. The selection of samples was based on the availability of data in the IDHS 2017 dataset (8,683 respondents). A stratified two-stage sampling method was used. Data were gathered through a household questionnaire and women of childbearing age questionnaire. Univariate, bivariate, and multivariate analyses were conducted using the chi-squared test and a simple logistic regression. **Results:** The factors that influenced the rate of cesarean section deliveries in Indonesia in 2017 were birth attendants (p value = 0.01; PR = 3.12; 95% CI = 2.88–3.38), number of Antenatal Care (ANC) visits (p=0.02; PR=1.23; 95%CI=1.03–1.47), low wealth index (p=0.02; PR=0.89; 95%CI=0.81–0.98), place of delivery (p=0.01; PR=0.87; 95%CI=0.81–0.94), and ANC provider (p=0.01; PR=0.57; 95%CI=0.53–0.62). The results of the analyses also obtained confounding factors namely: parity and birth interval. **Conclusion:** Factors that influenced cesarean delivery in Indonesia in 2017 were a low wealth index, number of ANC visits, ANC provider, place of delivery, and birth attendants.

ABSTRAK

Latar belakang: Persentase persalinan bedah sesar di Indonesia mengalami peningkatan pada tahun 2012-2017 dari 12% menjadi

17%. **Tujuan**: *Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berhubungan dengan persalinan bedah sesar di Indonesia pada tahun 2017.* **Metodologi**: *Desain penelitian berupa cross sectional menggunakan data sekunder Survei Demografi Kesehatan Indonesia (SDKI) pada tahun 2017. Sampel penelitian yaitu ibu yang melahirkan anak terakhir di seluruh Indonesia yang terpilih menjadi sampel dalam SDKI 2017 pada kurun waktu lima tahun terakhir survei dilakukan setelah di eksklusi data missing. Pemilihan sampel penelitian dilakukan berdasarkan ketersediaan data dalam dataset SDKI 2017 dengan besar sampel sebanyak 8.683 responden. Metode sampling SDKI 2017 adalah sampling dua tahap berstrata. Pengumpulan data menggunakan kuesioner rumah tangga dan kuesioner wanita usia subur. Analisis data penelitian yaitu univariat, bivariat, dan multivariat menggunakan uji Chi-Square dan Regresi Logistik Sederhana.* **Hasil**: *Penelitian menunjukkan bahwa faktor yang berhubungan dengan persalinan bedah sesar di Indonesia pada tahun 2017 adalah penolong persalinan adalah tenaga kesehatan spesialis (p=0,01; PR=3,12; 95%CI=2,88–3,38), kunjungan ANC ≥4 kali (p=0,02; PR=1,23; 95%CI=1,03–1,47), indeks kekayaan rendah atau kuintil 1 dan 2 (p=0,02; PR=0,89; 95% CI=0,81-0,98), tempat persalinan di fasilitas pelayanan kesehatan swasta (p=0,01; PR=0,87; 95%CI=0,81-0,94), dan pemeriksa ANC oleh bukan tenaga kesehatan (p=0,01; PR=0,57; 95%CI=0,53-0,62). Hasil analisis juga didapatkan faktor perancu yaitu paritas dan jarak kelahiran.* **Kesimpulan**: *Faktor yang berhubungan dengan persalinan bedah sesar di Indonesia tahun 2017 adalah indeks kekayaan rendah, kunjungan ANC, pemeriksa ANC, tempat persalinan, dan penolong persalinan.*

INTRODUCTION

The risk of maternal death can occur during pregnancy and childbirth, with postnatal bleeding the highest risk at the time of delivery. Certain medical indications require that a cesarean section should be performed. The rate of cesarean delivery in the world has increased between 1990 and 2014, from 6.70% to 19.10% (Betrán, Ye, Moller, Zhang, & Gülmezoglu, 2016).

The research results of Boerma, et al (2018) show that the proportion of cesarean deliveries in 2015 had almost doubled from 2010, increasing from 12.10% to 21.10% in 169 countries. Cesarean deliveries in Indonesia have increased from 1997 to 2017, from 4.30% to 17%. The proportion of cesarean deliveries in Indonesia between 2012 and 2017 increased from 12% to 17%, based on the results of the IDHS 2017. The international healthcare community has considered the ideal rate for cesarean deliveries between 10% and 15% since 1985. This is supported by WHO research, which found that a cesarean delivery rate of more than 10% at the population level is not associated with a reduced rate of maternal and infant mortality (WHO, 2014).

Factors that influenced cesarean delivery in Indonesia in 2013 were upper economic status, higher education, urban area, employment, maternal age of more than 35 years, gestational age of more than 42 weeks, primipara, delivery with complications, complications in pregnancy and childbirth, incomplete ANC visits, and twin pregnancies (Sihombing, Saptarini, & Putri, 2017). Research by Boerma, et al (2018) found that one of the factors affecting cesarean delivery was a low risk delivery. WHO (2014) suggests cesarean delivery should only be performed on women with certain medical indications, who have a high risk at delivery, because cesarean delivery can lead to permanent complications, disability, or maternal and infant mortality. This study aims to determine the factors that influenced the rate of cesarean section deliveries in Indonesia in 2017.

METHODS

This analytical study used a cross-sectional research design. Secondary data were gathered from the Indonesian Demographic and Health Survey (IDHS) in 2017, focusing on the population of women of childbearing age (15 to 49). The sample selected for this study were mothers who gave birth to their last child either through vaginal delivery or cesarean section delivery in Indonesia in the last five years of the survey (between January 2012 and June 2017). The exclusion criteria for the study was missing data.

The IDHS 2017 sampling method was stratified through two-stage sampling. Sample size was calculated using formula of different proportions. The calculation obtained a minimum sample size of 1,404 respondents and researchers decided to use all respondents in the study sample. Data filtering resulted in a total sample of 8,683 respondents. The sample was selected based on the availability of cesarean delivery data in the IDHS 2017 dataset. Respondents with missing data were excluded from the calculation, before a sample of respondents who experienced vaginal delivery and cesarean delivery was selected. Research data were collected using a household questionnaire and a woman of childbearing age questionnaire.

The dependent variable of this study is the type of birth that is divided into two groups, namely cesarean birth and vaginal delivery. The independent variables of the study were socio-demographic factors, consisting of age (<20 years, 20–35 years, >35 years), residence, education, occupation, wealth index, and parity.

Labor history factors were also assessed through several variables – multiple pregnancy, birth interval (cut-off point two years), birth size (normal birth weight: 2,500–4,000 grams; low birth weight: <2,500 grams; large birth weight: >4,000 grams), and a history of labor complications.

Non-medical indication factors were categorized by the respondents' answers related to the decision time for cesarean delivery. This question was only answered by respondents who had experienced a cesarean delivery in the last five years.

This study also explored health service factors, including the number of ANC visits, the ANC provider, the place of delivery, and the delivery attendants. Data analysis calculated weight as a result of a cluster sampling method when selecting subjects or research samples for collecting data. Univariate, bivariate, and multivariate analyses were conducted. Researchers described the characteristics of each variable in the form of percentage or proportion. A bivariate analysis was performed to determine the relationship between the independent and dependent variables, except for the cesarean decision-making variable. The bivariate analysis was conducted using a chi-squared test. A multivariate analysis was performed to examine the effects of other factors that may have influenced cesarean delivery. Through a multivariate analysis using the simple logistic regression prediction model, an assessment of confounding was conducted. The confounding variables were detected by a change in the value of Exp (B) > 10%. In addition, a PR (prevalence ratio) was used in the bivariate and multivariate analyses.

RESULTS

The number of respondents in the study was 8,683 (Figure 1). The proportion of study respondents among mothers who gave birth to their last child via caesarean delivery between 2012 and 2017 was 19.08% (1,656 respondents); the proportion of respondents who gave birth via vaginal delivery was 80.92% (7,027 respondents; see Table 1).
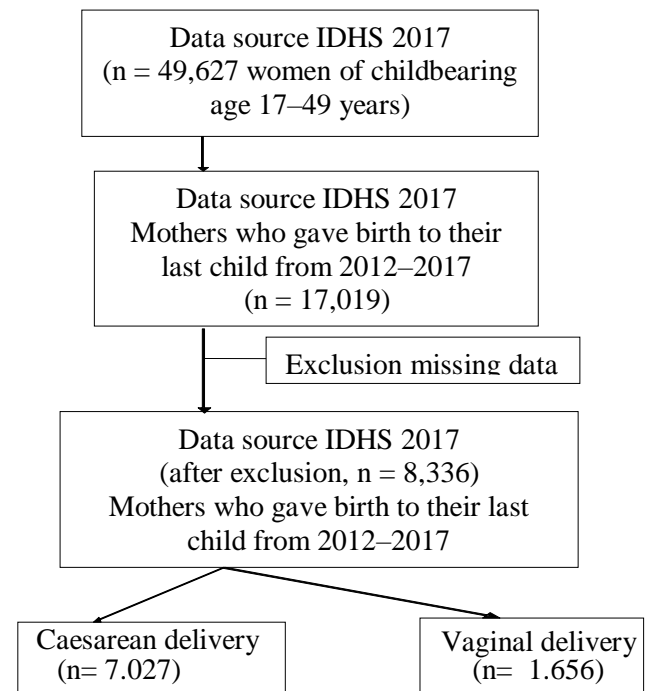

Figure 1. Sampling Scheme

Table 1
Univariate Analysis Research Variables Caesarean Section of Delivery in Indonesia 2017

Variable	n	%
Type of Delivery		
Vaginal delivery	7027	80.92
Caesarean delivery	1656	19.08
Age (years)		
< 20	221	2.55
20-35	6424	73.98
>35	2038	23.47
Residence		
Urban	4229	48.71
Rural	4454	51.29
Education		
Low (Not school and Primary school)	2.276	26.20
Intermediate (Lower and upper secondary school)	5.632	64.90
High (Academic/ College)	775	8.90
Occupation		
Work	4258	50.97
Not work	4425	49.03
Wealth Index		
Low (Quintile 1 and 2)	3562	41.02
Medium (Quintile 3)	2472	28.47
High (Quintile 4 and 5)	2649	30.51
Parity		
Primipara	3103	35.73
Multipara and Grande Multipara	5580	64.27
Multiple Pregnancy		
Twin	67	0.80
Not Twin	8616	99.20
Pregnancy Complication		
Labor with pregnancy complication	7650	88.10
Labor without pregnancy complication	1033	11.90
Birth Interval		
At risk	386	4.40
No risk	5177	59.60
Unknow	3120	35.90
Birth Size (gram)		
< 2.500	616	7.10
2.500 – 4.000	7821	90.10
> 4.000	246	2.80
Childbirth Complication		
Labor with childbirth complication	6164	70.99
Labor without childbirth complication	2519	29.01
Caesarean delivery decision-making		
After the start of labor	550	6.30
Before labor	1093	12.60
Not answered	7040	81.10
ANC Visit (times)		
≥4	8155	93.90
<4	528	6.10
ANC Provider		
Non health worker	6398	73.70
Health worker	2285	26.30

(Continued)

Table 1
Continued

Variable	n	%
Place of Delivery		
Private	5054	58.20
Public	3629	41.80
Birth Attendant		
Specialist health worker	894	10.30
Non health worker and non-specialist health worker	7789	89.70
Total	8683	100.00

Based on the results of the multivariate analysis final model, the factors related to cesarean delivery in Indonesia in 2017 were wealth index, multiple pregnancy, the number of ANC visits, the ANC provider, the place of delivery, and the delivery attendants. Confounding variables were parity and birth interval (see Table 2). The strength of the relationship between the factors that influenced cesarean delivery rates was based on the PR value; the greater the PR value, the greater the effect on cesarean delivery rates. The PR values of the variables, from largest to smallest, were specialist health worker as a birth attendant (PR = 3.12), four or more ANC visits (PR = 1.23), low wealth index (PR = 0.89), private place of delivery (PR = 0.87), and a non-healthcare worker as the ANC provider (PR = 0.57; see Table 2).

Table 2
Final Model of Multivariate Analysis using Simple Logistic Regression Prediction Model

Variable	Coeficient	*p* value	PR	95% CI
Residence				
Urban	0.16	0.11	1.07	0.99 – 1.15
Rural		Reference	Reference	
Wealth Index				
Low (Quintile 1 and 2)	-2.34	0.02	0.89	0.81 – 0.98
Medium (Quintile 3)		Reference	Reference	
High (Quintile 4 and5)	0.93	0.35	1.04	0.96 – 1.13
Parity				
Primipara	1.39	0.16*	1.33	0.89 – 1.43
Multipara and Grande Multipara		Reference	Referensi	
Multiple Pregnancy				
Twin	1.47	0.14	1.17	0.95 – 1.43
Not twin		Reference	Reference	
Birth Interval				
At risk	-0.42	0.67*	0.96	0.81 – 1.15
No risk		Reference	Reference	
Unknow	0.91	0.36*	0.83	0.56 – 1.24
ANC Visit				
≥4 times	2.29	0.02	1.23	1.03 – 1.47
<4 times		Reference	Reference	
ANC Provider				
Non health worker	-12.77	0.01	0.57	0.53 – 0.62
Health worker		Reference	Reference	
Place of Delivery				
Private	-3.69	0.01	0.87	0.81 – 0.94
Public		Reference	Reference	
Birth Attendant				
Specialist health worker	27.75	0.01	3.12	2.88 – 3.38
Non health worker and non specialist health worker		Reference	Reference	

*confounder or confounding

DISCUSSION

The proportion of cesarean deliveries in Indonesia in 2017 in this study was 19.08%. Based on the 2017 IDHS, the total proportion of cesarean deliveries in Indonesia in 2017 was 17%. The proportion of cesarean deliveries in Indonesia increased from 12% in 2012 and to 17% in 2017. The ideal rate for cesarean delivery, between 10% and 15%, was identified by the international healthcare community and research conducted by WHO found that a rate higher than 10% at the population level is not associated with a reduced rate of maternal and infant mortality (WHO, 2014).

One of the contributors to an increase in cesarean section delivery was the mothers' perceptions of cesarean delivery as being safer than vaginal delivery (Guendelman et al., 2017). There is no supporting evidence on the benefits of cesarean delivery without certain medical indications, so that's why cesarean delivery should only be performed on mothers with certain medical indications. This was demonstrated in this study, as cesarean decision making was more common in the time before labor (12.60%), compared to after labor had begun (6.30%). This is because medical indications that require cesarean delivery can be known before delivery. Only a univariate analysis was used for this variable, as mothers who gave birth vaginally did not answer this question. This led to a considerable amount of missing data, as 81.1% of mothers did not answer the related questions. The high rate of deciding on a cesarean delivery before labor could be due to the considerations of the mother or her baby. Cesarean delivery is performed 97.50% of the time due to a medical indication and 2.50% of the time due to non-medical indications, in the form of a patient request. There is a factor of trust; for example, in China, people believe that certain dates bring benefits so plan deliveries on those dates (Subekti, 2018).

Factors that influenced cesarean delivery in Indonesia in 2017 were a low wealth index, number of ANC visits, ANC provider, place of delivery, and birth attendants. The confounding factors were parity and birth interval. No explanation was found for parity and birth interval being confounding factors in previous studies.

Low and high wealth indices have a different effect on cesarean delivery. Mothers in the low wealth index (quintiles 1 and 2) were influenced with cesarean delivery, while mothers in the high wealth index (quintiles 4 and 5) were not. Mothers with a low wealth index had a 0.89 chance of undergoing a cesarean delivery, while mothers with a high wealth index were 1.04 times more likely to undergo a cesarean delivery, compared to mothers with a moderate wealth index (quintile 3). These results were in line with research conducted by Putri & Herdayati (2014), who found that a higher wealth index leads to a greater opportunity for cesarean delivery. The high proportion of cesarean deliveries for mothers with a high wealth index could be due to the cesarean procedure being expensive and requiring more complex levels of obstetric care (Guendelman et al., 2017). The cost of a cesarean delivery is higher than some incomes, so people with a low wealth index may not be able to afford to pay the higher cost (Haider et al., 2018).

A multiple pregnancy did not influence the cesarean delivery rates in Indonesia in 2017. The chance of a mother pregnant with two babies (twins) undergoing a cesarean delivery was 1.17 times higher than a mother who was pregnant with one baby. The result of this study are in line with research conducted by Sihombing, Saptarini, & Putri (2017), which found that mothers with a multiple pregnancy are 6.07 times more likely to undergo a cesarean delivery compared to mothers with a single pregnancy. However, research by Yaya, Uthman, Amouzou, & Bishwajit (2018) found no significant relationship between a multiple pregnancy and cesarean delivery in a public healthcare facility; in a private healthcare facility, they found a significant relationship, as mothers with a multiple pregnancy were 22.94 times more likely to undergo cesarean delivery.

The number of ANC visits had a PR of 1.23, which can be interpreted to mean that mothers who had four or more ANC visits (complete) were 1.23 times more likely to undergo a cesarean delivery compared to mothers who had less than four ANC visits (incomplete). Begum et al (2017) mentioned that more ANC visits lead to an increased chance of cesarean delivery compared to fewer or no ANC visits. Sihombing, Saptarini, & Putri (2017) state that mothers with incomplete ANC visits have a 0.65 reduced chance of cesarean delivery. Febbryanti, Fajar, & Sari, (2016) also state that mothers with incomplete ANC visits were 0.74 times less likely to undergo a cesarean delivery than mothers with complete ANC visits, after controlling for sociodemographic factors and pregnancy complications.

The results of this research were not in line with the Indonesian government's program related to complete ANC visit, which recommends at least

four visits during pregnancy to reduce maternal mortality (Ministry of Health RI, 2014b).

The results of this study were more correctly interpreted as cesarean delivery occurring 1.23 times more often in mothers with complete ANC visits (95% CI: 1.03–1.47) than mothers with incomplete ANC visits, after comparison with Indonesian government theory and programs. The assumption is that cesarean delivery is more common in mothers with complete ANC visits because women with high-risk pregnancies require more ANC visits to monitor these risks (Putri & Herdayati, 2014). Complete ANC visits could be due to mothers with pregnancy complications requiring routine monitoring (Narzary, Tsawe, & Susuman, 2017). Cesarean delivery that has been planned before delivery will lead to more ANC visits, to consult on the delivery plan (Putri & Herdayati, 2014).

The place of delivery had a PR of 0.87 (95% CI: 0.81–0.94), indicating that mothers who delivered in a private healthcare facility were 0.87 times more likely to undergo a cesarean delivery compared to mothers in a public healthcare facility. This is in contrast to the research of Abbas, Amir, & Sadiq (2018), who found that cesarean delivery in private healthcare facilities was 1.34 times more likely. This high rate of cesarean delivery in private healthcare facilities was due to private healthcare facilities seeking profit and encouraging cesarean deliveries without medical indications. (Rahman, Haider, Rahman, Ahmed, & Khan, 2018) and being able to pay the elective cesarean delivery procedures (Guendelman et al., 2017). Rifai (2017) and being able to pay the elective cesarean delivery procedures.

The Indonesian government program encourages childbirth to occur in a healthcare facility, especially a public healthcare facility (Ministry of Health RI, 2014a). The Indonesian government program encourages childbirth to occur in a healthcare facility, especially a public healthcare facility (Sihombing et al., 2017), as Indonesia is a developing country, with the majority of income earners in the middle to low categories.

ANC examinations and delivery should be conducted by healthcare workers with knowledge and skills in the relevant health field. Limited healthcare worker resources in certain areas can lead to labor being assisted by people other than healthcare workers, such as traditional birth attendants and family (Ministry of Health RI, 2014b). Mothers who underwent ANC examinations with non-healthcare worker were 0.57 times less likely to undergo a cesarean delivery compared to mothers who had ANC examinations with a healthcare worker. These results are in line with research conducted by Putri & Herdayati (2014), who found that mothers accessing antenatal care or ANC specialist healthcare workers (obstetrician) were 2.20 times more likely to undergo a cesarean delivery compared to non-specialist healthcare workers. Pristya, Herdayati, Besral, & Fika (2018) found that ANC examinations conducted by obstetricians were 6.60 times more likely to lead to a cesarean delivery compared to those conducted by a midwife.

The results of this study are not in line with the Indonesian government program that encourages labor to be assisted by healthcare worker (Ministry of Health RI, 2014b). Based on a comparison with the Indonesian government's theory and program, the results of this study were more accurately interpreted as indicating cesarean delivery was 0.57 times lower in mothers accessing antenatal care or ANC with non-healthcare workers, compared to those accessing healthcare workers. Cesarean delivery was more common in mothers accessing ANC examinations with healthcare workers because mothers who undergo ANC examinations with specific healthcare workers will be assisted in a cesarean delivery by those healthcare workers. If an ANC examination was conducted by a specialist in a private healthcare facility, this will usually lead to a cesarean delivery (Rahman, Haider, Rahman, Ahmed, & Khan, 2018). ANC workers provide options and advice related to pregnancy and labor.

Mothers who gave birth assisted by specialist healthcare workers (obstetrician) were 3.12 times more likely to undergo a cesarean delivery compared to those assisted by a non-healthcare worker or non-specialist healthcare worker. These results are in line with Putri & Herdayati (2014), who found that the chance of a cesarean delivery was 1.1 times higher for mothers assisted by specialist healthcare workers compared to non-specialist workers. Cesarean deliveries must be conducted by specialists (obstetricians) in a supporting facility with appropriate infrastructure, such as hospital.

Avoiding the problem of misinterpretation, these results can be more correctly interpreted to mean that cesarean delivery is 3.12 times more likely for mothers who give birth assisted by specialist healthcare workers (obstetricians) and 8.54 times more likely compared to those assisted

by a non-healthcare worker or non-specialist healthcare worker. This can be because the majority of mothers undergoing cesarean delivery have medical indications that require this procedure, which can only be performed by a specialist healthcare worker (obstetrician). Although labor is initially assisted by non-healthcare workers or non-specialist workers, if a mother displays medical indications for cesarean delivery, she will be referred to a specialist healthcare worker.

Selecting healthcare workers as birth attendants is becoming more common in Indonesia, although there are still people who choose non-healthcare workers. Hidra, Majid, & Rasma (2017) stated that 56.80% of mothers choose a healthcare worker as a birth attendant and 43.20% choose non-healthcare workers. The factors that influence selection are knowledge, husband's support, and pregnancy checks. Pregnancy examinations or ANC visits affect the rate of delivery with a healthcare worker, because routine ANC visits (minimum of four times during pregnancy) identify complications that could arise and allow a safe and optimal delivery to be planned (Ermawati, Pratiwi, & Maryam, 2018).

Research Limitations

This study is limited in the cross-sectional research design, as this cannot determine the direction of the relationship; that is, whether parity causes cesarean delivery or vice versa. In addition, the variables of medical indications in mother, fetus, and placenta, as well as non-medical indications that led to cesarean delivery, cannot be included in this study because of the limitations in the data source.

CONCLUSION

The factors that influenced cesarean section delivery rates in Indonesia in 2017 were a low wealth index, the number of ANC visits, the ANC provider, the place of delivery, and the delivery attendants. In addition, there were confounding factors, in the form of parity and birth interval. It is necessary to increase the implementation of Indonesian government programs related to cesarean delivery, according to these risk factors.

CONFLICT OF INTEREST

The authors declare that no conflict of interest in this study.

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