



# A Higher Maternal Education Level Could Be a Critical Factor in the Exceeded Cesarean Section Delivery in Indonesia

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## Abstract

**Background:** Cesarean section (CS) could be life-saving with medically indicated, but without it, both women and children could be at risk. The maximum rate for CS is 15%, but it tends to exceed globally.

**Objective:** We aimed to analyze the education level's role in the delivery of CS in Indonesia.

**Methods:** We used the 2017 Indonesia Demographic and Health Survey data. The study sampled 15,357 women who delivered in five last years. Besides delivery mode and education level, the study also used nine control variables: residence, age, marital, employment, parity, wealth, insurance, antenatal care, and birth type. The study employed a binary logistics regression.

**Results:** The results show women with secondary education (16.5% CS) are 2.174 times (AOR 2.174; 95% CI 1.095-4.316), and higher education (33% CS) are 3.241 (AOR 3.241; 95% CI 1.624-6.469) times more likely to deliver by CS than no-school education (4.4% CS). There was no significant difference between primary (9.1%) and no-education women. Apart from education, primiparous women, age 34-34 yr, attending antenatal care  $\geq 4$  times, non-poorest, having insurance, living in the city, and being unemployed also related to higher risk of CS.

**Conclusion:** Exceeded CS in Indonesia occurs mostly in higher education women. Higher education women were more likely to access more information and technology, therefore health promotion on healthy normal birth on social media or m-Health (mobile device-based health promotion) and involving health authorities at every level were suitable to reduce the overuse of the CS.

**Keywords:** Cesarean section; Education level; Childbirth; Maternal health; Public health

## Introduction

Cesarean section (CS) is among the obstetric treatments intended to decrease maternal and fetal mortality and morbidity when standard vaginal delivery threatens life (1). The rate of SC has exceeded the number suggested by the WHO, that is, 10%-15% (2). Globally, 21.1% of women give CS birth, and it is predicted by 2030, the rate will be 28.5%(3). In Indonesia, the rate

of CS was 17.6% in 2018 (4) compared to the 2013 national data, which is 9.8% (5).

Reasons to take CS are multifaceted and include medical and non-nonmedical factors. Some medical factors include prior CS, greater maternal age (older than 35 yr), nulliparity, a height of 145 cm, birth age of 42 wk, parity of one birth, giving birth with labor hardship, a previous history of complications during pregnancy and labor (6,7).



Meanwhile, the non-medical reasons could result from the mother's fear of childbirth, anxiety about fetal injury, the trauma of previous delivery, suggestion from doctors, anxiety about the gynecologic examination, and lack of support (8).

The substantial increase in CS usage frequently for non-medical purposes is cause for concern, given the hazards to both women and children. After CS birth, maternal mortality and morbidity are nearly five times higher than after vaginal delivery (9). SC without any medical consideration heightened the risks for children, like increased asthma incidence and obesity in children (10,11). A higher risk for autism spectrum disorders and attention-deficit/hyperactivity disorder and significantly higher rates of infections, dermatitis, and metabolic disorders were also found in CS children compared to vaginally-born children (12,13). Decision-making in choosing CS is a multifactorial process. One crucial factor is women's empowerment. Education is essential to women's empowerment in intra-household decision-making, including women's health care. Education positively connects with women's decision-making authority within the household (14).

Inconsistencies are still found in women's education role for CS. In Brazil, women with a higher level of education have a higher tendency to have a CS (15). Low education levels indirectly affect women's decision to undergo elective CS by influencing pregnancy-specific anxiety (16). Meanwhile, a study showed no differences between educational levels in the decision-making for women's delivery by a planned CS (17). Most women will accept CS if their husbands approve (18). However, in critical conditions, a woman must have the ability to make her own decision. Higher-educated women can make more logical decisions regarding their health. Inconsistencies are what makes CS interesting. Women with advanced degrees could play a greater role in decision-making, particularly in CS. This issue may be caused by factors other than increased knowledge that CS is less painful

and more luxurious than normal vaginal birth (19). A preference for CS was strongly associated with worries about changes to the body after pregnancy and birth, a positive view of obstetric technology, and exposure to information about pregnancy and birth in the media (20).

Based on the background narration, we aimed to investigate the role of maternal education level on CS deliveries in Indonesia.

## **Material and Methods**

### *Data source*

This cross-sectional study analyzed the secondary data from 2017 Indonesian Demographic and Health Survey (IDHS). The IDHS was a component of the Inner City Fund's global survey as part of the Demographic and Health Survey (DHS) program. We submitted a register for data access to the DHS website, and the DHS will approve it with instructions for download (<https://dhsprogram.com/data/Using-Datasets-for-Analysis.cfm>).

### *Population and sample*

The study population is women of childbearing age (15-49 yr) who gave birth in the last five years in Indonesia (2013-2017). The IDHS used stratification and multistage random sampling to select the required samples. The study analyzed 15,357 respondents as a sample based on the sampling methods. The inclusion criteria in this study were women aged 15-49 yr who gave birth within 5 yr before the survey was conducted. Exclusion criteria are samples with incomplete data.

### *Study variables*

The outcome variable for this study is the mode of delivery: normal/vaginal and CS. The research used education level as an exposure variable: no school, primary, secondary, and higher education. The study used nine control variables in the analysis: residence type, age group, marital status, employment status, parity, wealth index, health insurance, antenatal care, and parity (21-23).

Residences consisted of urban and rural. Maternal ages were divided into ages 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. Current marital status includes never married, married/living with a partner, and divorced/widowed. The employment status comprises unemployed and employed. The parity consisted of primiparous (<2 children) and multiparous ( $\geq 2$  children).

The 2017 IDHS used the wealth index formula, a weighted estimate of a household's total spending, for wealth status. The survey constructed the wealth index using primary data on household expenditures on health insurance, food, lodging, and other items. In addition, the survey divided income into quintiles: poorest, poorer, middle, richer, and richest. Health insurance comprises uninsured and insured. Meanwhile, the study divided antenatal care into <4 times and  $\geq 4$  times. Furthermore, the study splits the type of birth into single and twin.

### *Data analysis*

We used the Chi-Square test in the first stage to perform a bivariate analysis. We used a binary logistic regression test in the final stage (enter method) and presented adjusted odds ratios (AOR) with 95 percent confidence intervals (95% CI). We carried out all statistical analyses using the IBM SPSS 26 version (Armonk, New York,

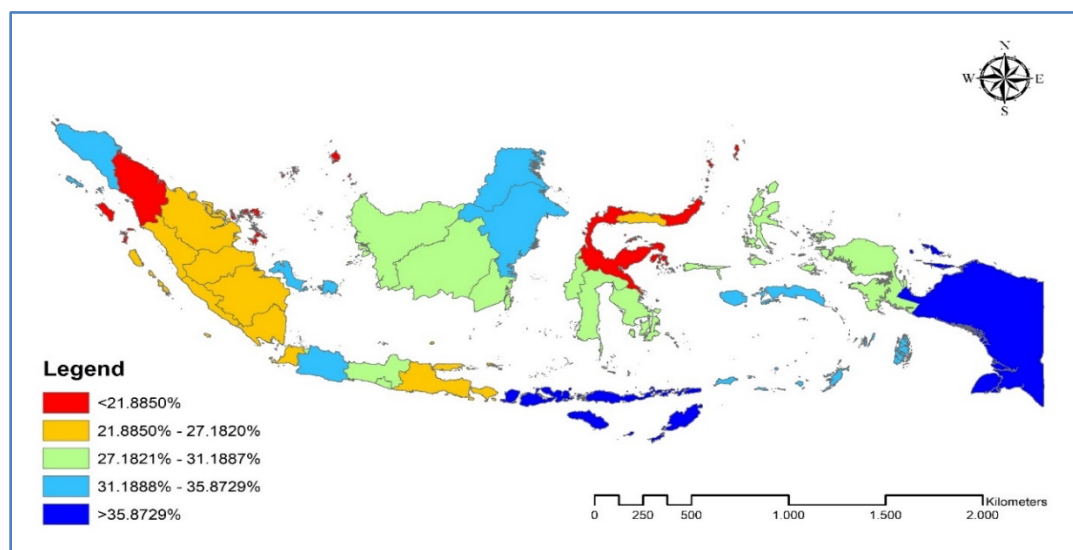
United States). We used ArcGIS 10.3 to define the spatial distribution of CS by proportion by the province in Indonesia (ESRI Inc., Redlands, CA, USA). The Indonesian Bureau of Statistics provided a shapefile of administrative border polygons for this study.

### *Ethical approval*

The study used secondary data from the 2017 IDHS. The Institutional Review Board of Inner City Fund (ICF) International adhered to the US Department of Health and Human Services requirements for the "Protection of Human Subjects" (45 Code of Federal Regulations (CFR) 46). Participants in IDHS 2017 signed written consent forms, and the consent of the children's parents or guardians was obtained (under 16 yr). The informed consent procedure was carried out by the DHS. The author received permission to use data from the website (<https://dhsprogram.com>).

## **Results**

Indonesia's delivery average by CS is 17.1% nationally. Moreover, Fig. 1 shows the uneven delivery distribution by CS proportion by the province in Indonesia. The highest prevalence of CS is in the Province of Bali at 33.3%.



**Fig. 1:** Distribution of delivery by proportion by the province in Indonesia, the IDHS 2017

**Descriptive Statistics**

The statistical description of the respondents shows the higher level of education, the higher proportion of CS. Based on the residence, the

highest proportion of CS in the higher education group is in urban areas. According to the age group, CS is highest in the age group range of 30-34 (Table 1).

**Table 1:** Descriptive Statistics of Respondents (n=15,357)

Variables	Education level				P-value
	No Education (n=204)	Primary (n=3,860)	Secondary (n=8,633)	Higher (n=2,660)	
Mode of Delivery					*<0.001
- Normal/Vaginal	95.6	90.9	83.5	68.5	
- Cesarean Section	4.4	9.1	16.5	31.5	
Place of residence					*<0.001
- Urban	15.7	33.1	53.5	61.8	
- Rural	84.3	66.9	46.5	38.2	
Age group					*<0.001
- 15-19	1.0	2.7	3.5	0.2	
- 20-24	10.3	11.5	20.2	7.8	
- 25-29	13.2	19.6	25.6	32.0	
- 30-34	22.1	24.9	24.2	32.5	
- 35-39	28.4	24.8	17.6	19.6	
- 40-44	16.2	13.2	7.4	6.5	
- 45-49	8.8	3.3	1.4	1.4	
Marital status					0.078
- Never married	0.0	0.1	0.2	0.2	
- Married/Living with a partner	96.1	96.2	96.7	97.5	
- Divorced/Widowed	3.9	3.7	3.1	2.3	
Employment Status					*<0.001
- Unemployed	35.8	56.2	58.9	27.6	
- Employed	64.2	43.8	41.1	72.4	
Parity					*<0.001
- Primiparous	9.3	18.6	34.0	40.9	
- Multiparous	90.7	81.4	66.0	59.1	
Wealth status					*<0.001
- Poorest	78.4	47.8	21.6	7.9	
- Poorer	12.7	23.4	20.9	11.2	
- Middle	4.9	16.3	21.9	13.5	
- Richer	2.5	8.9	21.0	22.4	
- Richest	1.5	3.6	14.6	44.9	
Health insurance					*<0.001
- Uninsured	42.6	42.8	41.3	20.3	
- Insured	57.4	57.2	58.7	79.7	
Antenatal care					*<0.001
- < 4 times	40.7	17.1	9.5	6.5	
- ≥ 4 times	59.3	82.9	90.5	93.5	
Type of birth					0.232
- Single birth	98.5	99.0	99.3	99.3	
- Twin	1.5	1.0	0.7	0.7	

Note: \*P-value < 0.001; \*\*P-value < 0.010.

Regarding marital status, married women lead in all groups of education levels. Based on employment status, employed women dominated in no education and higher education groups.

According to health insurance ownership and antenatal care visits, insured women and women with antenatal care visits lead in all education levels four or more times. Furthermore, based on the type of birth, single birth dominated all education levels.

Table 2 shows the results of the binary logistic regression test. Based on education level, secondary education women are 2.174 times more likely to deliver by CS than no-education women (AOR 2.174; 95% CI 1.095-4.316). Higher education women are 3.241 times more prone to CS delivery than no education women (AOR 3.241; 95% CI 1.624-6.469). No significant difference finds between primary and no education on CS.

**Table 2:** Results of Binary Logistic Regression (n=15,357)

<i>Predictors</i>	<i>P-value</i>	<i>Cesarean Section</i>		
		AOR	95% CI Lower Bound	Upper Bound
Education level: No Education (ref)	-	-	-	-
Primary	0.258	1.487	0.747	2.961
Secondary	*0.026	2.174	1.095	4.316
Higher	**0.001	3.241	1.624	6.469
Place of residence: Urban	*<0.001	1.266	1.144	1.402
Rural (ref)	-	-	-	-
Age group: 15-19 (ref)	-	-	-	-
20-24	0.233	1.257	.863	1.831
25-29	**0.006	1.689	1.166	2.447
30-34	*<0.001	2.501	1.715	3.647
35-39	*<0.001	3.308	2.256	4.852
40-44	*<0.001	4.011	2.699	5.958
45-49	*<0.001	3.402	2.093	5.529
Employment Status: Unemployed (ref)	-	-	-	-
Employed	***0.041	0.907	0.826	0.996
Parity: Primiparous (ref)	-	-	-	-
Multiparous	*<0.001	0.527	0.468	0.593
Wealth status: Poorest (ref)	-	-	-	-
Poorer	*<0.001	1.692	1.429	2.005
Middle	*<0.001	2.059	1.739	2.437
Richer	*<0.001	2.582	2.178	3.062
Richest	*<0.001	3.386	2.836	4.044
Health insurance: Uninsured (ref)	-	-	-	-
Insured	*<0.001	1.637	1.481	1.810
Antenatal care: < 4 times (ref)	-	-	-	-
≥ 4 times	*<0.001	1.968	1.610	2.405

Note: CI: confidence interval of 95%; \*P-value < 0.001; \*\*P-value < 0.010; \*\*\*P-value < 0.050.

AOR: adjusted odd ratio

Apart from education level, the study also found seven significant control variables related to CS

delivery in Indonesia. Women in urban areas are 1.266 times more likely to deliver by CS (AOR

1.266; 95% CI 1.144-1.402). Based on the age group, the older a woman is, the higher the likelihood of CS delivery. Employed women are 0.907 times less likely to deliver by CS (AOR 0.907; 95% CI 0.826-0.996). Women with two or more children are 0.527 times less likely to deliver by CS than primiparous (AOR 0.527; 95% CI 0.468-0.593). Based on the wealth status, the better the wealth status, the higher the likelihood of CS delivery.

Table 2 indicates insured women are 1.637 times more likely to deliver by CS than uninsured women (AOR 1.637; 95% CI 1.481-1.810). Women with  $\geq 4$  antenatal care visits are 1.968 times more likely to deliver by CS than those with  $< 4$  visits (AOR 1.968; 95% CI 1.610-2.405).

## Discussion

The higher the woman's education level, the higher the possibility of CS birth. A meta-analysis in Sub-Saharan Africa shows that educated respondents are more likely to use CS (24). The increased likelihood of CS in higher-educated women can also be associated with increased financial ability because of better job opportunities (25,26). Women with higher education in this study tend to have better socioeconomic status, indicated by a higher prevalence at the level of rich or very rich, insurance coverage, and most of them work. Women with higher education are also more likely to give birth to skilled birth attendants, including gynecologists (26). Positive attitudes and views toward CS, along with possible information bias, cause women with better maternal health services to choose CS (27). With a higher CS prevalence than the WHO recommendation, women with secondary (16.5%) and higher education (31.5%) has a higher probability of CS delivery overuse.

This study shows better wealth status heightened the likelihood of CS. Studies in Kenya and Tanzania also revealed CS delivery was associated with higher socioeconomic status, indicating CS was not only due to medical indications (22). Higher financial needs in performing CS, conse-

quently, insurance coverage associated with increased CS delivery as confirmed in this study and previous studies in France and India (28,29). The uneven figure was found regarding the geographical aspect, viewed from the per-province distribution. The highest prevalence of CS was found in Bali Province, with the lowest rate of stunting (30) and the highest rate of maternal ANC in Indonesia (31). Better health indicators and maternal health service access are related to Indonesia's heightened CS rate. Women who live in urban areas are more likely to deliver by CS. Women with higher education tend to live in urban areas due to better education and employment opportunities (32). More available and accessible medical services and higher hospital utilization among urban people could explain the higher rate of CS (33,34).

Some female characteristics associated with the risk of childbirth are also associated with increased CS. The older a woman is, the more likely she will give birth to CS. The study in Ghana found that older women (45-49 yr) had a ten times higher risk of having CS (35). This increased likelihood of CS in older women is related to the increased obstetric complications at an older age (36).

Based on parity, women with two or more children are less likely to deliver by CS than primiparous women. This result is consistent with other studies which showed that primiparous women had a higher probability of CS (35,37). Primiparous women find it challenging to make decisions on a delivery method, are more worried and fearful due to the lack of experience, and therefore are more prone to choose the CS delivery (38).

Women with four visits are more likely to deliver by CS than those with  $< 4$  visits. Research showed increased ANC utilization is related to obstetrics factors and complications (39). As found in this study, an increase in antenatal care is also related to the ability to access health services, higher education, and socioeconomic status (40). Antenatal care time is a valuable opportunity to educate women about CS birth indications and hazards (29). Research in France

shows when understanding the CS risk presented in prenatal education, the probability of a CS decreases by 20% to 40% for women participants (28).

The proper antenatal education related to CS could reduce the overuse of CS without medical indications, including the CS exceeded utilization among women with higher education levels. A meta-analysis on health information during pregnancy stated that delivery is critical information needed, and the health provider is the main source of information, but several barriers existed, such as uncomfortable feelings to discuss, restricted times to see a health provider and long lines of waiting (41). Another study exploring high-education women's experience in health education during pregnancy revealed the need to optimize healthcare providers, online and digital sources (42).

Incomplete or inaccurate information could heighten the tendencies towards CS due to fear of the birth process, bodily changes, and favorable attitudes toward obstetric technology. Asian young women also had a significantly higher fear of birth. They were more likely to prefer CS, compared to Caucasian students explaining a higher rate of exceeded CS in Asian countries (19,20). Perceived safety of CS operation, short-term postpartum benefits, maternal request in the absence of indications, previous CS experience, fear of pain in normal vaginal delivery, and doctor's recommendation are the key to CS prevalence, therefore should be targeted in lowering the exceeded CS (19,43). Young educated women and communities must receive powerful messages emphasizing the uniqueness of the female bodily ability to carry and give birth to a healthy child. The health education materials related to child delivery should be understandable and patient-centered, facilitating mothers to avoid a maternal request for CS despite the absence of indication (42).

Using big data as analysis material enabled this research to demonstrate generalized work up to the national level. Meanwhile, the use of secondary data was the study's limitation to use only variables limited to those provided by the

ICF. Factors influencing CS could not be studied, like obstetric complications (37).

## **Conclusion**

Education level has a role in CS delivery in Indonesia. The higher the woman's education, the higher the possibility of giving birth to CS. Women with no education and women with advanced degrees have unequal utilization. Proper health education related to CS, especially in higher-educated women in Indonesia, such as optimizing health care provider information, online and digital sources, is highly recommended to reduce the overuse of CS. Campaigns such as "Keeping birth normal" must promote childbirth as a significant but universal life event while simultaneously countering perceptions that birth is harmful. Healthcare professionals can help balance how planned vaginal delivery is portrayed in the media by giving evidence-based, nonjudgmental information to these women to help them make informed birth decisions. On the other hand, CS delivery can save lives and should be accessible to all.

## **Journalism Ethics considerations**

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## **Conflict of interest**

The authors declare no competing interests

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