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Highest economic status increases risk of cesarean section in women of childbearing age

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ABSTRACT

BACKGROUND

Cesarean section (CS) rates that are higher than the WHO recommendation may pose morbidity and mortality risks for both mother and child. In recent years, the number of CS deliveries has been increasing in developed and developing countries. The aim of the present study was to determine the rate of CS delivery and socioeconomic and demographic factors as risk factors of cesarean delivery in women of childbearing age.

METHODS

This cross-sectional study used data from the 2017 Indonesian Health Demographic Survey (IDHS). The research subjects were 14,724 women of childbearing age aged 15-49 years who had given birth and met the inclusion criteria. The rate of CS was determined and the associations between independent and dependent variables were explored using logistic regression.

RESULTS

The CS rate was 17.9%. Variables that had a significant relationship with cesarean delivery were geographic region, economic status, occupation, education, birth attendant, insurance ownership and antenatal care visits. The most dominant influencing variable was the highest economic status (OR 3.566; 95% CI: 2.857-4.452). Respondents with the highest economic status had a 3.5 times greater risk of having a cesarean delivery than subjects with the lowest economic status after controlling for the other variables.

CONCLUSION

This study demonstrated that the highest economic status increased the risk of CS delivery in women of childbearing age. The current epidemiological findings and evidence suggest adopting and implementing some strict guidelines in the health system to avoid unnecessary delivery by CS.

Keywords: Cesarean section, demographic health survey, economic status, women of childbearing age

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INTRODUCTION

The World Health Organization (WHO) recommends that the average number of cesarean sections should range from 10% to 15% as the maximum -target limit in an effort to avoid the risks of this mode of delivery to mother and baby.[1] However, it turns out that the cesarean section rate (CSR) continues to increase and to exceed the WHO recommended average. Betran et al.[2] reported that based on their studies from 1990 to 2014 in 121 countries, mean CSR increased by 12.4% (from 6.7% to 19.1%). Some countries with higher CSR than the WHO standards are the Latin American and Caribbean countries with the highest CSR of 40.5%, Europe with 25%, and Asia 19.2%, whereas Africa with 7.3% is still below the recommended average.[2] On the other hand, the CSR in some areas of Pakistan ranges from 47% to 65%.

The number of mothers who are giving birth by cesarean section also continues to increase in Indonesia; according to the Indonesian Demographic and Health Survey (IDHS) data, the CSR in Indonesia was 5%, then it rose to 12% in 2012 and increased again to 17.0% in 2017.[4] As the proportion of births increased in health facilities in Indonesia, in the last 30 years Indonesia's CSR has also increased considerably, from 1.6% in 1991 to 17.6% in 2017.[5] Even the study of Oktarina et al.[6] in government and private hospitals in Jakarta, Indonesia, reported that the trend of cesarean section (CS) deliveries is very high, reaching 70%, especially in private hospitals.

Currently CS is a life-saving intervention for mothers and children during childbirth, but this procedure can also have short-term and long-term health effects for women and children. The prevalence of maternal morbidity and mortality is higher after CS compared to vaginal delivery. Cesarean section has been shown to increase the risk of uterine rupture, abnormal placentation, ectopic pregnancy, stillbirth and premature delivery.[7] Cesarean delivery also affects the child's sensory perception, sensory integration ability, and neuropsychiatry, and the relationship between mother and child.[8]

Exclusive breastfeeding is especially important for the baby's growth and development, but CS can reduce the chances of continued breastfeeding.[9] Breast milk production is strongly influenced by the release of the hormones oxytocin and prolactin.[10] In cesarean delivery, maternal anxiety due to postoperative pain and also the effects of anesthetics/drugs may delay the onset of breastfeeding.[11] Based on previous studies, it was reported that the majority of mothers who gave birth by the cesarean method stopped breastfeeding after 12 weeks of delivery.[12] Research in Niger by Hitachi et al.[13] also reported that many mothers who had cesarean section did not give exclusive breastfeeding, and even stopped breastfeeding after 1 week of giving birth.

Medically, the most common indication for CS is cephalopelvic disproportion (CPD) or narrow pelvis.[14,15] Other indications are obstructed labor, multiple pregnancies, non-reassuring fetal heart rate pattern (NRFHRP), failed induction and augmentation of labor, malpresentation and malposition, and antepartum hemorrhage.[16] Sungkar and Basrowi[17] also stated that sociodemographic factors, namely advanced maternal age, high socioeconomic status, higher education, living in urban areas and ownership of health insurance were also found to be associated with the incidence of cesarean delivery.

Cesarean section procedures aim to save lives when there are medical indications for delivery, but CS can pose a higher risk of morbidity and mortality when performed without medical indications.[5] Ironically, according to Sandall et al.[7] the rate of cesarean delivery continues to increase, especially in cases without medical indications, even though this procedure can have short-term and long-term health effects on women and children. In addition, it turns out that a high CSR of more than 10% is also not associated with a decrease in maternal and neonatal mortality.[17,18]

Based on this description, it can be concluded that there is a large risk that threatens the mother and child due to CS without medical indications which contributes greatly to the high CSR but is proven not to be associated with a decrease in maternal and neonatal mortality. A study in Ghana involving 4948 research participants revealed that CS delivery is associated with maternal age, level of education, occupation, parity and antenatal care (ANC) visits.[19] Women's socioeconomic status and health system factors were associated with the increased use of CS.[20] In contrast, a Bangladesh study found that the logistic regression analysis has traced no significant variation in CS rate among mothers of varying educational levels as compared to the reference group (mothers with no education) (p>0.05). Similarly, mothers' religious status, age at first childbirth, age at first marriage, working status, exposure to media, including wanted indexed child and husband's educational level, resulted in no significant difference in CS rate among various groups as compared to their corresponding reference groups.[21] Because the results of previous studies that found an association of socioeconomic and demographic factors, working status, and age with CS, are still inconsistent, therefore the association of socioeconomic and demographic factors, working status, and age with CS delivery are still to be determined. This study aimed to raise the importance of investigating the causes of high CSR, especially in Indonesia, which is useful in developing strategies for optimizing the use of appropriate CS. The objective of this study was to determine the socioeconomic and demographic factor as risk factors of CS in Indonesia.

METHODS

Research design

This was a cross-sectional study using secondary data from the 2017 Indonesian Health Demographic Survey (IDHS), which is a survey data jointly carried out by the Central Statistics Agency (BPS), the National Population and Family Planning Agency (BKKBN), and the Ministry of Health (Kemenkes) from 24 July to 30 September 2017. Survey funding was provided by the Government of Indonesia, assisted by the United States Agency for International Development (USAID).

Study Subjects

The population of this study comprised all respondents in 34 provinces of Indonesia who were successfully interviewed by the IDHS team. The sample for the present study amounted to 14,724 respondents who were selected based on one inclusion criterion, namely women of childbearing age in the range of 15-49 years who had given birth in the last 5 years at the time of the interview and two exclusion criteria consisting of missing data and invalid data.

Main outcomes

The main outcome was cesarean delivery and was categorized into subjects who underwent cesarean delivery (coded as 1) and otherwise (coded 0).

Main exposure variables

The main exposure variables in this study were education, occupation, economic status, region, insurance ownership, birth attendant, and ANC visits. Educational level was divided into three categories, namely low if respondent had no education or had attended elementary school, intermediate if respondent had attended junior high school or senior high school, and high if respondent had studied for diploma degree or attended college. Economic status was based on the economic quintile owned by a household. Households were scored based on the number and type of items they had, from television sets to bicycles or cars, and on housing characteristics, such as drinking water sources, toilet facilities, and main building materials for the floor of the house. This score was calculated using principal component analysis. National economic quintiles were arranged based on

household scores for each person in the household and then divided into five quintiles, namely lowest, low, middle, high and highest.

Statistical methods

Data were analyzed by univariate analysis and by bivariate analysis using the simple logistic regression test to determine the relationship between the independent variable and the dependent variable. Multivariate analysis was by means of logistic regression test with predictive model to analyze the independent variable with the most dominant effect on the dependent variable. The significance level set at p<0.05.

Ethical clearance

Ethical clearance was obtained for the 2017 IDHS from the National Ethics Committee. The respondents' identities have all been deleted from the dataset. Respondents provided written consent for their involvement in the study. The researchers have obtained permission to use the data for the purposes of this study through the following website: https://dhsprogram.com/data/new-user-registration.cfm. This study was approved by the Health Research Ethics Committee of the Faculty of Public Health, Sriwijaya University, under No. 217/UN9.FKM/TU.KKE/2022.

RESULTS

From Table 1 it can be seen that around 17.9% of respondents gave birth by cesarean section. The majority of respondents (58.6%) had secondary education, 58.8% had insurance, 57.6% resided on Java/Bali, 51.5% were employed, 41.4% had middle to highest economic status, 86.3% gave birth assisted by health workers and 91.7% had complete antenatal care visits.

Based on the results of the simple logistic regression analysis in Table 2, it was found that all independent variables namely education, occupation, economic status, geographic region,

insurance ownership, birth attendants, and ANC visits have a significant relationship with incidence of cesarean delivery. All of the independent variables studied also have an OR of >1, which means that there is an association in the form of increasing the risk of an outcome (i.e. a risk factor for cesarean delivery). Based on the OR value, respondents with the highest economic status have a 6.3 times greater probability of having a cesarean delivery compared to respondents with the lowest economic status (95% CI: 5.243-7.733). Respondents with complete ANC visits have a 3 times greater probability of having a cesarean delivery compared to respondents with incomplete ANC visits (95% CI: 2.413-3,926).

Table 1. Socio-demographic characteristics of the study participants (n= 14,274)

Variable	n	%
Education		
High	2,188	14.9
Middle	8,634	58.6
Low	3,902	26.5
Insurance policy ownership		
Yes	8,661	58.8
No	6,063	41.2
Region		
Sumatra	3,282	22.3
Java/Bali	8,477	57.6
East Indonesia	2,965	20.1
Employment status		
Employed	7,585	51.5
Unemployed	7,139	48.5
Economic status		
Highest	2,829	19.3
High	3,054	20.7
Middle	3,053	20.7
Low	2,980	20.2
Lowest	2,808	19.1
Childbirth attendant		
Health workers	12,702	86.3
Non-health workers	2,022	13.7
ANC visits		
Complete	13,501	91.7
Incomplete	1,223	8.3
Cesarean section delivery		
Yes	2,632	17.9
No	12,092	82.1

*Education: Low: no education or elementary school; intermediate: junior high school or senior high school; high: diploma or college; ANC : antenatal care

Table 2. Crude odds ratios of determinants of CS delivery

Variable	CS delivery				OR(95% CI)	p value
	Yes (n,%)		No (n,%)			
Region						
Sumatra	649	19.8	2633	80.2	1.655 (1.418 -1.930)	0.000
Java/Bali	1899	18.9	6878	81.1	1.561 (1.346 -1.809)	0.000
East Indonesia	384	13.0	2581	87.0	1	-
Economic status						
Highest	911	32.2	1917	67.8	6.367 (5.243-7.733)	0.000
High	691	22.6	2363	77.4	3.918 (3.215-4.775)	0.000
Middle	483	15.9	2569	84.1	2.524 (2.072-3.074)	0.000
Low	351	11.8	2629	88.2	1.788 (1.457-2.195)	0.000
Lowest	195	6.9	2613	93.1	1	-
Childbirth attendant						
Health workers	2508	19.7	10194	80.3	3.746 (2.940-4.772)	0.000
Non-health workers	125	6.2	1897	93.8	1	-
ANC visits						
Complete	2547	18.9	10954	81.1	3.078 (2.413-3.926)	0.000
Incomplete	86	7.0	1137	93.0	1	-
Education						
High	735	33.6	1453	22.4	4.684 (3.944-5.562)	0.001
Intermediate	1517	17.6	7117	82.4	1.974 (1.703-2.287)	0.003
Low	380	9.7	3522	90.3	1	-
Insurance policy ownership						
Yes	1854	21.4	6807	78.6	1.850 (1.651-2.071)	0.000
No	778	12.8	5285	87.2	1	-
Employment status						
Employed	1455	19.2	6130	80.8	1.201 (1.080-1.336)	0.000
Unemployed	1178	16.5	5961	83.5	1	-

Notes: ANC: antenatal care; Education: Low: no education or elementary school; intermediate: junior high school to senior high school; high: diploma or college; OR: odds ratio

Respondents with a higher educational level have a 4.6 times greater probability of having a cesarean delivery compared to respondents with a low level of education (95%CI: 3.944-5.562). The results of the simple logistic regression selection analysis show that the independent variables have a p-value <0.25. Based on the results, it can be concluded that the variables of education, geographic region, insurance policy ownership, occupation, economic status, birth attendant, and ANC visits can be included in the multivariate analysis modeling.

Based on the results of the multivariate analysis in Table 3, which shows the most influential variable as indicated by the adjusted odds ratio is the highest economic status variable (AOR= 3.566; 95% CI: 2.857-4.452). This means that respondents with the highest economic status have a 3.5 times greater

probability of having a cesarean delivery when compared to respondents with the lowest economic status after controlling for the variables of education, geographic region, insurance ownership, birth attendant and ANC visits.

DISCUSSION

The cesarean delivery rate in Indonesia has continually increased, from 1.6% in 1991 to 17.6% in 2017.[5] The present study, which used IDHS 2017 data, also reported that Indonesia's CSR was 17.9%. This figure exceeds the range of CSR recommendations from WHO, which is 10%-15%.[1] Medically, the study by Aprina and Puri reported on the factors that could influence the occurrence of cesarean delivery, namely severe preeclampsia, placenta previa, fetal

Table 3. Adjusted odds ratios of determinants of CS delivery

Variable	AOR	95 % CI	p value
Education			
High	2.001	1.646 - 2.433	0.000
Intermediate	1.285	1.095 – 1.507	0.002
Low	1		
Region			
Sumatra	1.459	1.257 - 1.694	0.000
Java/Bali	1.140	0.990 - 1.314	0.068
East Indonesia	1		
Insurance policy ownership			
Yes	1.519		
No	1	1.349 - 1.710	0.000
Economic Status			
Highest	3.566	2.857 - 4.452	0.000
High	2.718	2.195 - 3.366	0.000
Middle	1.941	1.575 - 2.393	0.000
Low	1.504	1.216 - 1.860	0.000
Lowest	1		
Childbirth attendant			
Health worker	2.182	1.701 - 2.799	
Non-health worker	1		0.000
ANC visits			
Complete	1.907	1.497 - 2.431	0.000
Incomplete	1		

Note : ANC: antenatal care; Education: Low: no education or elementary school; intermediate: junior high school to senior high school; high: diploma or college; AOR: adjusted odds ratio

position abnormalities, and delayed parturition.[22] Several predictors of CS in Pakistan according to Murtaza et al.[23] were multiparity, breech position, fetal distress, oligohydramnios, preeclampsia, and previous uterine scars.

In Indonesia, the variety of CSR in each geographic region is caused by sociodemographic factors. The disparity in CSR between one region and another, which is influenced by the diversity of the regions, education, and occupation in Indonesia, is similar to the world trend.[5] Sumatra, which is the western part of Indonesia, has a CSR of 19.8%, followed by Java/Bali with 18.9% and East Indonesia with 13%, all of which are greater than the 10% recommended by the WHO. In addition, pregnant women residing in Sumatra are 1.6 times more likely to have a CS procedure than those in East Indonesia. The CSR in Pakistan varies by province, being 40% in Khyber Pakhtunkhwa and Punjab, 43% in Islamabad, 49% in Sindh and 51% in Azad Jammu Kashmir.[23] The study of Yaya et al.[24] on CS in sub-Saharan Africa shows the diversity of CSR in public health facilities that ranges from 3% in Burkina Faso to 15.6% in Ghana.

The results of the present study show that the highest CSR in women of high educational status is around 33.6% and in working women is about 19.2%, which is greater than the 16.5% of non-working women. This finding is also in line with previous research and the global trend of CSR in general. The factors of urban residence and high educational status influence the occurrence of CS in other developing countries as well, such as in South and Southeast Asia.[25] Mumtaz et al.[26] reported that the prevalence of CS in Pakistan among working mothers tended to increase in the following three survey periods, namely 16.6% (DHS 1990), 24.7% (DHS 2006) and 25% (DHS 2012).

Women with high educational status tend to choose to work, so there is a similar pattern of relationship of educational factors and occupational factors with the incidence of CS. Health preferences of women with high

educational status are generally higher than those of women without formal education.[27] High formal education has a strong relationship with women's decision-making autonomy in making choices.[28] In addition, women with high formal education may believe that CS is safer and does not interfere with their workload.[29]

The WHO recommends ANC to provide a positive pregnancy experience, the minimum recommendation in 2006 being 4 ANC visits, followed by the minimum of 8 ANC contacts (in 2016) with a trained ANC service provider. These efforts are the management of complications during pregnancy that are likely to lead to CS procedures.[30] However, the results of the present study showed a different finding, in that 18.9% of mothers had cesarean delivery and 91.7% had complete ANC visits. The latter percentage is much higher than in the group of mothers who did not receive complete ANC services, which is around 7%. A secondary analytical study in Pakistan using DHS 2012-2013 data reported that mothers who received ANC care more than four times were more likely to give birth to children through CS procedures. In women who reported complications of pregnancy, gynecological risk avoidance was the reason for the choice of cesarean section.[31]

Pregnant women who attend antenatal care are more likely to give birth in health facilities and follow postnatal care,[32] such that they have safe deliveries by health workers. The high prevalence of ANC of 91.7% is also followed by a high trend of birth attendance with health personnel, namely 86.3% (Table 1). In addition to the fact that the prevalence of cesarean delivery is still relatively high among mothers who underwent complete ANC, it is note-worthy that the prevalence of cesarean delivery is also quite high in the group of mothers whose birth attendants are health workers, namely 19.7%. Even though the CSR in government-owned hospitals is around 30%-40%, there are private hospitals whose CSR can reach 70%.[6]

The percentage of women with cesarean delivery in Pakistan is high at 13.6%. According to Amjad et al.[31] Pakistani women who experience pregnancy complications, have high ANC utilization and deliver in private hospitals have a higher probability of obtaining a CS procedure. Therefore decisive action is needed such as detailed medical indications from doctors for CS and awareness of pregnant women to reduce the chances of pregnancy complications. Cesarean section delivery costs many times more than vaginal delivery, such that the family's economic ability becomes a consideration in choosing the CS method of delivery.[35] This can be seen from the results of the study which showed that the economic status variable was the most dominant. Respondents with the highest economic status have a 3.5 times greater probability of having a cesarean delivery than do respondents with the lowest economic status after controlling for other variables. Economic factors are also seen in CSR patterns in other countries, where the percentage of CS births in Ghana ranges from 5% in very poor women to 27.5% in very rich women.[34] The CSR in Brazil is particularly high among wealthier women or those in maternity hospitals in the private sector.[35] In developing countries, economic inequality factors influence the pattern of cesarean delivery rates, which may be due to inadequate access to emergency obstetric care in the very poor and the poor, in contrast with the high rates of cesarean deliveries without medical indication in the very rich group.[36]

The data show that insurance ownership is related to the incidence of cesarean delivery. The percentage of cesarean deliveries in the group of women who have insurance is relatively high, namely 21.4% (Table 2). These results are in line with the research of Jenabi et al.[37] who reported that the factors of educational level, socioeconomic status, place of residence and insurance ownership were significantly related to the mother's choice of cesarean delivery. The link between insurance and cesarean delivery rates in Indonesia can be seen from the National Health Insurance- Healthy Indonesian Card

Quality Control and Cost Control Team Report, that in the period of 2014-2018 around 57% of *Jaminan Kesehatan Nasional- Kartu Indonesia Sehat* (JKN-KIS) participants who gave birth chose the CS method. According to Widjayanti,[38] the CSR for JKN participants even reached 79.21%.

Several factors outside of sociodemographic and midwifery variables such as women's choice, women's fear, psychological factors and doctor's preference also contribute to high CSR.[23,39] Severe fear of childbirth in women causes them to be at higher risk for emergency CS and to be more likely to choose elective CS, mostly due to non-obstetric indications.[40] Solanki et al.[41] examined 6,542 births in South Africa, of which 4,815 were cesarean births, causing the CSR to reach 73.6%. Most of the CS were emergency CS (39.7%), followed by elective CS (39.5%).

Weak regulations concerning hospitals that offer CS service packages (profit-oriented) as well as regulations that encourage moral hazard in doctors, thus allowing CS requests without adequate medical indications, also contribute to high CSR.[6] Therefore, adequate awareness, appropriate prenatal and perinatal counseling, fetomaternal monitoring, monitoring of vaginal birth after cesarean (VBAC) efforts and promotion of institutional delivery (in health facilities with trained birth attendants) can minimize obstetric complications and CSR.[23,39] The present study has its limitations, such as the use of cross-sectional data that cannot determine a causal relationship, and the fact that there are several variables that have not been explored due to limited data regarding age, parity, maternal physical activity during pregnancy, delivery complications and the demand for cesarean delivery. On the other hand, it becomes difficult to limit the autonomy of women, especially those with higher income to demand or to suggest cesarean delivery. The government should consider this factor for controlling the cesarean delivery rate in Indonesia. Further study should expand this study by adding other

variables related to cesarean delivery with a better design like cohort study.

CONCLUSIONS

The current investigation based on the Indonesian Health Demographic Survey-2017 data has revealed that the prevalence of CS delivery in Indonesia is higher than that recommended by the WHO. Economic status is the dominant variable in the prevalence of cesarean delivery in Indonesia.

CONFLICT OF INTEREST

The authors declare no competing interest

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CONTRIBUTORS

HI contributed to conceptualizing the study design and acquiring the raw data for analysis; RA contributed to writing the manuscript then prepared the original draft of the manuscript. All authors have read and approved the final manuscript.

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