Too Posh to Push: Determinants of Planned C-Section Delivery Among Indonesian Women

Puguh Prasetyoputra1*, Marya Yenita Sitohang1, Angga Sisca Rahadian1, Tria Anggita Hafsari1

1Research Center for Population, Indonesian Institute of Sciences, Jakarta, Indonesia
*Corresponding author. E-mail: pprasetyoputra@gmail.com

ABSTRACT

Caesarean section (CS) delivery in Indonesia is on the rise and has drawn a considerable attention to its social determinants. However, information on planned CS delivery is limited in the Indonesian setting. Hence, this study aims at investigating its correlates. We employed data from the 2017 round of the Indonesian Demographic and Health Survey. The dependent variable is a nominal variable representing method of delivery (1 = natural, 2 = planned CS, 3 = unplanned CS). The explanatory variables comprise three groups, namely spatial, maternal, demographic, socio-economic variables, and access to information. We fitted simple and multivariable multinomial logit models using relative risk ratio as the measure of association. After selecting facility births only and deleting missing cases, we analysed an analytic sample of 12,225 births. Of those births we observed 22.89% were done by CS. There were slight differences related to region of residence and urban residence for both planned and unplanned CS. Higher maternal age corresponds with higher risks of both planned and unplanned CS. Complication during pregnancy was found to increase the risk of planned CS. Moreover, access to internet increases the probability of having planned and unplanned CS delivery. These findings suggest an indication of unnecessary CS deliveries that consume resources that could otherwise be used for other health needs. Educating expectant mothers and families on the benefits of natural birth could reduce the planned c-section rates in Indonesia and save health resources.

Keywords: C-section delivery, socio-economic status, health insurance, Indonesia

1. INTRODUCTION

Caesarean section (CS) is a crucial intervention in preventing maternal mortality. CS is a surgical incision performed as a method of childbirth, is usually chosen based on medical indications, although there are cases when it is demanded or elective [1]. The World Health Organisation (WHO) suggest that the rate to CS should not exceed 10-15 % of all deliveries [2]. Beyond such figures, there may be an indication of caesarean deliveries based on non-clinical grounds and may indicate its overuse [3]; which has potential adverse health and financial consequences. Caesarean sections in the developing world bear higher risk of complications and deaths than in developed countries [4]. The study by Boatin and colleagues [5] analysed data from 72 low- and middle-income countries and found an indication of underuse among poorer subgroups, an indication of overuse in the richer subgroups. Moreover, medically unnecessary CS pose a higher risk of post-partum morbidity [6], and lower odds of early breastfeeding initiation [7], and also a loss of economic resources which could be used for other more beneficial objectives [8].

There is an upward trend of CS deliveries in developing countries [5, 9-12]. In Indonesia, the trend is of similar direction. Based on a recent nationally representative survey, the figure has increased from 7% to 17% in the last decade (2007-2017) [13]. A deeper analysis was done by Hatt and colleagues [14] where they assessed the trends in rates of CS delivery in Indonesia from 1986 to 2002 by wealth quintile and found an increasing trend of CS delivery especially among wealthiest women. However, they did not address other determinants as their objective was to evaluate the village midwife programme in Indonesia. Moreover, Suryati [15] analysed the data from the 2010 Baseline Health Research (Riset Kesehatan Dasar – RISKESDAS) and concluded that the CS rate in Indonesia has exceeded the WHO’s recommendation. Furthermore, Sihombing, Saptarini, and Putri [16] utilised the 2013 round of RISKESDAS and determined the risk factors of CS delivery. Also, Suparmi, Kusumawardhani, and Susiloretni [17] analysed the 2013 RISKESDAS and...
examined the urban-rural inequality and determinants of CS delivery. These researches, however, have not specifically explored the determinants of planned CS delivery as they were restricted by the limitations in the data. The recent Indonesia Demographic and Health Survey (IDHS) fielded in 2017 has been improved to overcome this limitation. Hence, we analysed the data from the survey to investigate the correlates of planned CS deliveries in Indonesia.

2. METHOD

Data Source and Sample Size

We employed data from the 2017 IDHS, a large scale, nationally representative household health survey funded by the US Agency for International Development (USAID). The IDHS is conducted by Statistics Indonesia (Badan Pusat Statistik – BPS) in collaboration with the National Population and Family Planning Board (BKKBN) and the Indonesia Ministry of Health (MoH). For this analysis, we selected the children recode (KR). The details on the sampling and administered questions can be read elsewhere [13].

The population of interest is all the live births in the past five years. Thus, the sample is all the live births that occur during the five years preceding the survey, which is equivalent to 17,848 children. Figure 1 depicts the sample selection process in the analysis. We first removed those delivered at home (4,963 children). Then we removed missing cases (listwise deletion; 660 children). Hence, we are left with 12,225 children as the final analytic sample.

Variables Selection

The outcome variable, CS delivery, is measured by a categorical variable that takes the value of ‘1’ if the delivery method is normal (vaginal), ‘2’ if the delivery method is planned CS, and ‘3’ if the delivery method is unplanned CS. This variable was formed from two questions administered in the 2017 IDHS. First, the ever-married women were asked: “Was (NAME) delivered by caesarean, that is, did they cut your belly open to take the baby out?” The second question is: “was that caesarean section procedure has been planned before?”

As for the potential explanatory variables, we selected them based on previous literature [11, 17-27]. We categorized them into several groups, namely spatial variables, maternal variables, demographic variables, access to information, and socio-economic variables. The spatial variables comprise region of residence, place of residence, and whether the distance to health facility is a big concern. The maternal variables include maternal age at birth, whether child was wanted, birth interval, any problems during pregnancy, and any problems during labor. The demographic variables consist of birth cohort, relationship to the household head, literacy of the mother, household size, education of the mother, and education of the father. Moreover, access to information was represented by frequency of reading newspaper/magazine, frequency of listening to the radio, frequency of watching the television, and internet use. Furthermore, the socio-economic variables comprise occupation of the mother, occupation of the father, health insurance ownership, and wealth index. The wealth index has been constructed by the 2017 IDHS team and the details can be read elsewhere [13].

Statistical Analysis

Since the outcome variable is a three-category variable with no order of importance (nominal), we employed multinomial logic model (MNLM) to examine the relationship between the explanatory variables and CS delivery [28]. This regression model has also been used in previous health and social research [29]. We fitted simple (not shown in results for the sake of brevity) and multivariable MNLMs with relative-risk ratio (RRR) as the measure of association. Statistical significance is evaluated at the 1%, 5%, and 10% levels. We also tested for the “Independence of Irrelevant Alternatives” (IIA) assumption and tested for combining dependent categories [30]. These two tests were performed using the “mlogtest” command [28].

3. RESULTS AND DISCUSSION

Sample Characteristics

The final analytic sample comprises 12,225 observations. It was observed that more than one in five children (22.89%) was delivered by CS method. Of which 13.25% was unplanned CS and 9.64% was planned CS (Figure 2).
Table 1 presents the characteristics of the final analytic sample of 12,225 children. The sample predominantly resides in the Java region (35.77%) and in the urban areas of Indonesia (59.06%) with one out of ten (9.79%) has a difficulty in accessing health facility due to distance. Most of the births occurred when the mothers were in the 25 to 29-year age range (28.16%). The majority of the children was planned (80.74%). The majority of mothers experienced at least one problem during their pregnancy (89.16%) and their labour (71.08%).

Table 1. Sample Characteristics

| Variable                        | Category          | N   | %   |
|---------------------------------|-------------------|-----|-----|
| Region of residence             | Java              | 4,373 | 35.77 |
|                                 | Sumatra           | 3,309 | 27.07 |
|                                 | Bali & Nusa Tenggara | 1,176  | 9.62 |
|                                 | Kalimantan        | 1,066 | 8.72 |
|                                 | Sulawesi          | 1,663 | 13.60 |
|                                 | Maluku & Papua    | 638   | 5.22 |
| Place of residence              | Rural area        | 5,005 | 40.94 |
|                                 | Urban area        | 7,220 | 59.06 |
| Far from health facility        | No                | 11,028 | 90.21 |
|                                 | Yes               | 1,197  | 9.79 |
| Maternal age at birth           | < 20              | 821   | 6.72 |
|                                 | 20-24             | 2,581 | 21.11 |
|                                 | 25-29             | 3,442 | 28.16 |
|                                 | 30-34             | 3,107 | 25.42 |
|                                 | 35+               | 2,274 | 18.60 |
| Child was wanted                | Wanted then       | 9,871 | 80.74 |
|                                 | Wanted later      | 1,279 | 10.46 |
|                                 | Wanted no more    | 1,075 | 8.79 |
| Birth interval (years)          | First birth       | 4,257 | 34.82 |
|                                 | < 24              | 762   | 6.23 |
|                                 | 24-35             | 1,029 | 8.42 |
|                                 | 36-47             | 1,066 | 8.72 |
|                                 | 48-59             | 1,003 | 8.20 |
|                                 | 60+               | 4,108 | 33.60 |
| Any problems during pregnancy   | No                | 1,325 | 10.84 |
|                                 | Yes               | 10,900 | 89.16 |
|                                 | No                | 3,536  | 28.92 |

Table 2 presents the results of the final multivariable MNLM. The final multivariable MNLM is statistically significant (LR $\chi^2_{104}=1323.99, P < 0.001$) consisting of 21 explanatory variables. The model does not violate the IIA assumption and no categories of the outcome variable

Regression Results

Table 2 presents the results of the final multivariable MNLM. The final multivariable MNLM is statistically significant (LR $\chi^2_{104}=1323.99, P < 0.001$) consisting of 21 explanatory variables. The model does not violate the IIA assumption and no categories of the outcome variable
needs to be combined (P < 0.001). The adjusted McFadden R2 is fairly small of 6.60%. Although several variables become statistically insignificant, they are still included in the final model due to theoretical grounds and evidence of previous research.

Table 2. Results of the Multivariable Logistic Regression Analysis

| Variable                        | Planned CS vs normal s(aRRR) | Unplanned CS vs normal s(aRRR) |
|---------------------------------|------------------------------|-------------------------------|
| **Region of residence**         |                              |                               |
| Java (Ref.)                     | Ref.                         | Ref.                          |
| Sumatra                         | 2.1131 ***                   | 1.4564 ***                   |
| Bali & Nusa Tenggara            | 1.2269                       | 1.0149                       |
| Kalimantan                      | 1.0769                       | 1.1472                       |
| Sulawesi                        | 1.5110 ***                   | 1.0744                       |
| Maluku & Papua                  | 1.9308 ***                   | 1.1509                       |
| **Place of residence**          |                              |                               |
| Rural area (Ref.)               | Ref.                         | Ref.                          |
| Urban area                      | 1.0599                       | 1.0642                       |
| **Far from health facility**    |                              |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 0.8829                       | 0.8325 *                     |
| **Maternal age at birth (years)** |                              |                               |
| < 20                            | 1.0358                       | 0.6426 ***                   |
| 20-24 (Ref.)                    | Ref.                         | Ref.                          |
| 25-29                           | 1.3986 ***                   | 1.4224 ***                   |
| 30-34                           | 2.4029 ***                   | 1.8329 ***                   |
| 35+                             | 4.1084 ***                   | 2.4962 ***                   |
| **Child was wanted**            |                              |                               |
| Wanted then (Ref.)              | Ref.                         | Ref.                          |
| Wanted later                    | 0.9997                       | 0.7800 **                    |
| Wanted no more                  | 1.0167                       | 0.6949 ***                   |
| **Birth interval (years)**      |                              |                               |
| First birth                     | 0.7098 ***                   | 2.8810 ***                   |
| < 24                            | 0.9406                       | 1.0576                       |
| 24-35 (Ref.)                    | Ref.                         | Ref.                          |
| 36-47                           | 0.8994                       | 1.1907                       |
| 48-59                           | 0.8405                       | 1.1100                       |
| 60+                             | 0.7342 ***                   | 1.3656 **                    |
| **Any problems during pregnancy** |                              |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 1.2627 *                     | 1.0188                       |
| **Any problems during labour**  |                              |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 0.9471                       | 1.0564                       |
| **Birth cohort**                |                              |                               |
| 2012 (Ref.)                     | Ref.                         | Ref.                          |
| 2013                             | 1.1568                       | 1.0969                       |
| 2014                             | 1.3430 *                     | 1.0684                       |
| 2015                             | 1.4369 **                    | 1.1861                       |
| 2016                             | 1.4834 **                    | 1.2037                       |
| 2017                             | 1.3881 *                     | 1.2955 *                     |

**Relationship to household head**

Table 2. Results of the Multivariable Logistic Regression Analysis

| Variable                        | Planned CS vs normal s(aRRR) | Unplanned CS vs normal s(aRRR) |
|---------------------------------|------------------------------|-------------------------------|
| Wife (Ref.)                     | Ref.                         | Ref.                          |
| Household head                  | 0.9480                       | 0.5454 *                     |
| Other                           | 0.9612                       | 1.1155                       |
| Literacy of mother              |                              |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 1.7059                       | 0.8908                       |
| Household size (in persons)     | 0.9620 *                     | 0.9338 ***                   |
| Education of mother             |                              |                               |
| No formal                       | Ref.                         | Ref.                          |
| Primary                         | 0.4735                       | 1.9751                       |
| Secondary                       | 0.5178                       | 2.1866                       |
| Higher                          | 0.8548                       | 2.7069 *                     |
| Education of father             |                              |                               |
| No formal                       | Ref.                         | Ref.                          |
| Primary                         | 2.0330                       | 0.7777                       |
| Secondary                       | 2.6202                       | 0.8721                       |
| Higher                          | 2.4821                       | 0.7740                       |
| Frequently read newspaper/magazine |                          |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 0.9206                       | 0.8572 **                    |
| Education of mother             |                              |                               |
| No formal                       | Ref.                         | Ref.                          |
| Principal                       | 1.0851                       | 1.1875 ***                   |
| Frequently listen to the radio  |                              |                               |
| No (Ref.)                       | Ref.                         | Ref.                          |
| Yes                             | 1.2500                       | 1.1884                       |
| Education of father             |                              |                               |
| No formal                       | Ref.                         | Ref.                          |
| Agricultural worker (Ref.)      | Ref.                         | Ref.                          |
| Industrial worker               | 1.1270                       | 1.0370                       |
| Other                           | 1.1326                       | 1.1390                       |
| Homemaker                       | 1.1735                       | 1.2063                       |
| Occupation of father            |                              |                               |
| Agriculture worker (Ref.)       | Ref.                         | Ref.                          |
| Industrial worker               | 0.8627                       | 0.9343                       |
| Other                           | 0.9562                       | 1.0001                       |
| Not working                     | 1.2965                       | 1.2956                       |
| Health insurance                |                              |                               |
| None (Ref.)                     | Ref.                         | Ref.                          |
| Private/employer                | 1.6064 ***                   | 1.2765 *                     |
| Public insurance (JKN)          | 0.9165                       | 1.0354                       |
| Wealth index                    |                              |                               |
| Poorest (Ref.)                  | Ref.                         | Ref.                          |
| Poorer                          | 1.3711 **                    | 1.1125                       |
| Middle                          | 1.3727 **                    | 1.2218 *                     |
| Richer                          | 1.8416 ***                   | 1.5307 ***                   |
| Richest                         | 2.6897 ***                   | 1.6464 ***                   |

Source: Model constructed using the 2017 IDHS data.
Discussion

Our analysis of data from 12,225 births examines the determinants of planned CS delivery or unplanned CS delivery as opposed to normal (vaginal) delivery. Our results confirm the findings of other studies that maternal age at childbirth is positively associated with the likelihood of CS delivery [9, 11, 21, 23, 25]. The higher the age group at birth, the higher the probability of the women planning a CS delivery as opposed to a normal delivery. Moreover, having problems during the pregnancy may also increase the risk of CS delivery [21, 26]. We also find a similar relationship where women who experienced at least one complication during their pregnancy are more likely to planned for CS delivery (aRRR = 1.2627). Based on the birth cohort, there is an indication of an increasing trend of planned CS in Indonesia. The values of the RRR is generally increasing. Although this relationship needs to be examined further. Our findings confirm the studies by Hoxha and colleagues [18-20] where they argue that women with private health insurance have higher probability to have CS compared to those with no insurance cover (aRRR = 1.6064). Moreover, studies have proved the positive relationship between wealth and CS deliveries [11, 22, 24], particularly elective CS [27]. In line with these studies, we also find that affluence, represented by the household wealth index, also has a positive influence the probability of CS delivery, both planned and unplanned.

Limitations and Strengths of the Study

There are several limitations to this study. First, the secondary data was collected cross-sectionally, and thus hinders the establishment of causality. Second, there are variables that potentially determine the choice of CS delivery but were not available in the 2017 IDHS. One example is the height and weight of the mother [16, 22]. Third, one might argue that whether the CS delivery was planned or not does not necessarily reflect the mother’s demand for CS [31]. Complications may be found during antenatal care visits and hence the mother must opt for CS delivery. However, we assume that this is not the case as, unlike the 2012 IDHS, the 2017 IDHS lack data on complications during pregnancy. Nonetheless, this study uses a nationally representative data with large sample size and hence statistical power.

4. CONCLUSION

This paper provides observational evidence of the correlates of planned CS deliveries in Indonesia. By employing a nationally representative survey data, we observed that private health insurance ownership and higher socio-economic status corresponds to higher risk of planned CS, and these associations hold even after pregnancy and labor complications were included in the final multivariable model. Moreover, consistent with the existing literature, we also find that maternal age is positively associated with both planned and unplanned CS delivery. Furthermore, wider access to information also corresponds to higher probability of planned CS delivery. These findings indicate an increasing trend of planned and unnecessary CS deliveries. To the best of our knowledge, this paper is the first of its kind in the context of Indonesia that separates planned CS from unplanned CS. More resources should be allocated to examine how the supply of surgeons influence the uptake of CS.

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