DISCONTINUITY OF THE MATERNAL AND CHILD CASCADE OF CARE: EVIDENCE FROM INDONESIAN DEMOGRAPHIC AND HEALTH SURVEY

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Abstract. Lack of maternal and child health services lead to the maternal and infant mortality problems. The cascade of care for pregnant and postpartum women must be carried out, starting from antenatal care throughout delivery and beyond. Therefore, this study aimed to assess maternal and child health continuity using a cascade-of-care approach. The researchers analyzed data from the latest Indonesian and Demographic Surveys (IDHS) 2017. The sample of this study was 14,398 mothers. The cascade of care was then analyzed descriptively, covering all indicators of the continuum of care for maternal and child health on an ongoing basis, including antenatal care (ANC 4 visits or more), skilled birth attendant (SBA), facility delivery (FD), postnatal care (PNC1 means receiving medical attention in less than 2 days after delivery and PNC2 within 28 days after delivery), family planning (FP), and immunization. The analyses uncovered that of 14,398 mothers, 80.7% made ANC visits four times or more, but only 73.1% of those mothers continued to use the assistance of health workers during the delivery process. Furthermore, only 65.1% of mothers gave birth in health facilities, and 45.1% of them received PNC1 and PNC2. Of the mothers who received the two PNCs, 32.5% had followed the family planning program, and 16.8% of their children had received ten complete doses of the basic immunization recommendation. The findings also revealed a loss of continuity of care across the maternal and child health care indicators. Only 45.1% of mothers who had received antenatal care and safe facility delivery continued to have postnatal care. The numbers were even lower for immunization and family planning. Based on these findings, improving access and willingness to receive the continuum of care in maternal and child health is necessary.

Keywords: maternal and child health, safe delivery, antenatal care, postnatal care, immunization

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INTRODUCTION

Maternal, newborn, and child mortality and morbidity are still global health issues that need to be considered. According to World Health Organization (WHO) data, in 2015, about 303,000 maternal deaths occurred in the world, meaning that there were an average of 830 maternal deaths every day (WHO, 2015). Worldwide, neonatal deaths reached 2.4 million, with an average of 6700 deaths every day (UNICEF, 2019). In addition, the majority of maternal and neonatal deaths occur in developing countries (Anwar *et al*, 2015; Mohamed *et al*, 2022). In Indonesia, maternal and child mortality is caused by the disparities in maternal health services and adversity in accessing, especially using postnatal care (PNC) in rural areas (Cameron *et al*, 2019; Istifa *et al*, 2021). As such, one of the interventions to reduce maternal, newborn, and child mortality is an increase in maternal, newborn, and child healthcare coverage, which is usually measured by the number of antenatal care (ANC) visits, skilled birth attendants (SBA), and the number of PNC visits (Lassi *et al*, 2016; Thapa *et al*, 2020). However, health care coverage may not be sufficient to ensure that every mother and child receives a continuous set of health services from the stage of pregnancy to postpartum (Yeji *et al*, 2015).

Indonesia also experiences a high burden on maternal and child health. The geographical condition of Indonesia presents challenges to providing high-quality healthcare for women and children (Cahyono *et al*, 2021; Istifa *et al*, 2021). Previous study has reported that more than 50% of Indonesian women reported having maternal morbidity, and only 80%

received healthcare (Widyaningsih *et al*, 2017). On the other hand, the cascade of care in maternal and child health covers the period of pregnancy throughout delivery and postpartum care. The analyses of the cascade of care can provide insights into the continuation of healthcare received by a woman from their first antenatal visits throughout the maternal period and can be extended to the child (Chicumbe and Martins, 2022; Khatri *et al*, 2022).

In this regard, the assessment for the cascade of care for maternal and child health approach is an essential concern as it emphasizes access to comprehensive, integrated, and continuous interventions during pregnancy, childbirth, postpartum period, infancy, childhood, and pre-pregnancy period (Sserwanja *et al*, 2022). For this reason, this study aimed to assess the cascade of care for maternal healthcare and immunization in Indonesia. Hence, it can provide insights into the continuity of healthcare during a maternal period and immunization.

MATERIALS AND METHODS

Study design and participants

This study employed the 2017 Indonesian Demographic and Health Survey (IDHS) (National Population and Family Planning Board, Statistics Indonesia, Ministry of Health, and ICF, 2018). The 2017 IDHS was a cross-sectional survey with a multistage sampling design conducted to obtain a nationally representative sample of Indonesia. Data on maternal and reproductive health were obtained from women of reproductive age (15-49 years old) who had at least a live birth in the last five years before the IDHS survey year. Meanwhile, child data were obtained from the youngest child born in 2014 by the sampled women.

Sample size

The population of women of childbearing age (aged 15-49 years) based on IDHS 2017 data was 59,100 women. With the inclusion criteria of

being aged 15-49 years and having at least one live birth by 2012, the sample included in this study was 14,398 mothers.

Variables and measurements

The researchers assessed the cascade of care in maternal and child health through several indicators of maternal and child health services as the following: antenatal care (ANC), skilled birth attendant (SBA), facility delivery (FD), postnatal care (PNC), family planning (FP), and child immunization. ANC refers to four or more visits to antenatal care with a skilled provider (doctor, nurse, or midwife); SBA implies skilled birth attendants (doctors, nurses, or midwives); FD informs the health facility in which the respondents gave birth (hospital, primary health care, or clinic); PNC indicates mothers who received first medical examination in less than two days (PNC1) and within 28 days (PNC2) after delivery by trained health professionals; FP represents the use of family planning of the mothers; child immunization refers to basic immunization for children, including ten scheduled immunizations consisting of one dose of hepatitis B vaccine after delivery, one dose of polio vaccine after delivery, one dose of Bacille Calmette-*Guérin* (BCG) vaccine, three doses each of polio and pentavalent (diphtheria-tetanus-pertussis-hepatitis B and *Haemophilus influenzae* type B) vaccines, and one dose of measles vaccine.

We also considered multiple self-reported socio-demographic variables that could affect the continuum of care, *ie*, the mother's age (<20, 20-35 and >35 years), level of education (Primary school or lower, Secondary school, and College and higher), marital status (married or not married), employment status (yes or no), parity (1, 2, 3, and 4 or more), and family wealth which is divided into 5 quintiles namely quintile 1 (the lowest), quintile 2 (lower-middle), quintile 3 (middle), quintile 4 (upper-middle), and quintile 5 (the highest). The family wealth variable incorporated indicators of assets, *ie*, house and/or land ownership, water supply, latrine type, vehicle, and electronics ownership. Other socio-demographic variables were media

exposure consisting of newspaper, radio, and television (not at all, less than once a week and at least once a week), and then woman's autonomy in the decision-making of her healthcare which is divided into 3 levels, namely low if the decision maker is mainly made by other people (husband, partner, or some others), moderate if the decision maker is a joint decision, and high if the decision maker is mainly by herself. Then, birth prepared that indicates the level of readiness in facing the delivery process which consists of 6 categories, namely the place of delivery, transportation, assistance, payment, blood donation, and family planning (low if preparing 2 or less categories, moderate if preparing 3 to 4 categories, and high if preparing 5 or all categories), knowledge on key pregnancy danger signs such as vaginal bleeding, fever, convulsions, baby in wrong position, swollen limbs, faint, breathlessness and others (yes or no), last child's pregnancy was wanted (yes or no), health insurance coverage (yes or no), distance to healthcare which is divided into two categories according to the categorization of the IDHS data, namely big problem if experienced problems related to distance in accessing healthcare facilities, and not a big problem if did not experience these problems (National Population and Family Planning Board, Statistics Indonesia, Ministry of Health, and ICF, 2018), and areas or location of residence (rural or urban). We also included region variables from the Indonesian Central Bureau of Statistics data (Central Bureau of Statistics, 2020). The region was divided into three regions based on population density: 1) population density above 500/km^2; 2) population density above the national average of 112/km^2, but lower than 500/km^2; and 3) population density below the national average of 112/km^2.

Statistical analysis

Socio-demographic and other characteristics that could affect the cascade of care in maternal and child health were analyzed descriptively, comprising frequencies and cross-tabulations. To account for the unequal stratification of the number of various locations, a weighted analysis was performed. The cascade of care was also analyzed descriptively and presented

in the form of charts and narratives. All the analyses were conducted utilizing STATA version 17.0 (StataCorp, College Station, TX).

Ethical approval

This study was approved by the Research Ethics Committee of Faculty of Medicine Universitas Sebelas Maret (Ethical clearance number: 54/UN27.06.11/KEP/EC/2022). This study used secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS). All participants provided informed consents to participate in the 2017 IDHS.

RESULTS

Table 1 shows the characteristics of 14,398 mothers included in this study. Among all, 67.7% of respondents aged 20-35 years. Meanwhile, 59.2% of respondents had secondary education, 96.5% were married, 54.4% were homemakers, and the majority had one or two live births (35.5% and 35.9%, respectively). In addition, the level of family wealth was relatively evenly distributed from low-income to wealthy families (Quintiles 1 to 5). Respondents who were exposed to the mass media at least once a week were 87.6%. Moreover, more than half of the respondents (66.0%) took part in their healthcare decision-making, and 59.3% of respondents became members of health insurance. As many as 47.6% of respondents had prepared for their delivery process, 70.1% knew the dangerous sign of their pregnancy, and 83.9% wanted the last child at the time of pregnancy. Of the study population, more than half (58.1%) of respondents lived in area with population density above 500/km^2, 50.7% lived in rural areas, and 89.4% reported that distance to the health facility was not an issue.

Fig 1 depicts that of 14,398 mothers, 80.7% made ANC visits four times or more, but only 73.1% of those mothers continued to use the assistance of health workers during the delivery process. Furthermore, only 65.1% of mothers gave birth in health facilities, and 45.1% of them received postnatal

Table 1
Weighted proportion of women's socio-demographic characteristics (N = 14,398)

Characteristic	Frequency *n* (%)	95% confidence interval
Age (years)		
<20	346 (2.4)	2.1-2.7
20-35	9,733 (67.6)	66.6-68.6
>35	4,319 (30.0)	29.1-31.0
Education		
Elementary school or lower	3,700 (25.7)	24.4-27.0
Secondary school	8,524 (59.2)	57.9-60.5
College and higher	2,174 (15.1)	14.2-16.1
Marital status		
Married	13,894 (96.5)	96.2-96.9
Not married	504 (3.5)	3.2-3.8
Working		
Yes	6,565 (45.6)	44.4-46.7
No	7,833 (54.4)	53.3-55.6
Parity		
1	5,111 (35.5)	34.5-36.5
2	5,169 (35.9)	34.9-36.9
3	2,649 (18.4)	17.6-19.2
4 or more	1,469 (10.2)	9.6-10.8
Wealth[1]		
Quintile 1	2,635 (18.3)	17.2-19.5
Quintile 2	2,894 (20.1)	19.1-21.1
Quintile 3	3,024 (21.0)	20.0-22.0
Quintile 4	3,023 (21.0)	20.0-22.0
Quintile 5	2,822 (19.6)	18.3-20.8

Table 1 (cont)

Characteristic	Frequency *n* (%)	95% confidence interval
Media exposure		
Not at all	346 (2.4)	2.1-2.8
Less than once a week	1,439 (10.0)	9.4-10.7
At least once a week	12,613 (87.6)	86.8-88.3
Decision making[2]		
Low	2,203 (15.3)	14.5-16.2
Moderate	2,692 (18.7)	17.8-19.6
High	9,503 (66.0)	64.8-67.1
Birth prepared[3]		
Low	2,462 (17.1)	16.1-18.1
Moderate	5,082 (35.3)	34.2-36.5
High	6,854 (47.6)	46.3-48.9
Women's knowledge on the danger in pregnancy		
Yes	10,093 (70.1)	69.0-71.2
No	4,305 (29.9)	28.8-31.1
Last child wanted		
Yes	12,080 (83.9)	83.1-84.6
No	2,318 (16.1)	15.4-16.9
Health insurance		
Yes	8,538 (59.3)	58.1-60.5
No	5,860 (40.7)	39.5-42.0
Distance to healthcare		
Big problem	1,526 (10.6)	9.8-11.5
Not a big problem	12,872 (89.4)	88.5-90.2

Table 1 (cont)

Characteristic	Frequency *n* (%)	95% confidence interval
Location of residence		
Urban	7,098 (49.3)	48.1-50.4
Rural	7,300 (50.7)	49.6-51.9
Region classified by population density		
Population density >500/km^2	8,365 (58.1)	57.0-59.2
Population density 112/km^2 - 500/km^2	3,887 (27.0)	26.1-28.0
Population density <112/km^2	2,146 (14.9)	14.2-15.6

[1]Wealth is divided into 5 quintiles namely quintile 1 (the lowest), quintile 2 (lower-middle), quintile 3 (middle), quintile 4 (upper-middle), and quintile 5 (the highest). The family wealth variable incorporated indicators of assets, *ie*, house and/or land ownership, water supply, latrine type, vehicle, and electronics ownership.

[2]Decision making means woman's autonomy in the decision-making of her healthcare which is divided into 3 levels, namely low if the decision maker is mainly made by other people (husband, partner, or some others), moderate if the decision maker is a joint decision, and high if the decision maker is mainly by herself.

[3]Birth prepared indicates the level of readiness in facing the delivery process which consists of 6 categories, namely the place of delivery, transportation, assistance, payment, blood donation, and family planning (low if preparing 2 or less categories, moderate if preparing 3 to 4 categories, and high if preparing 5 or all categories).

km^2: square kilometer

care in less than 2 days after delivery and within 28 days after delivery. Of the mothers who received the two PNCs, 32.5% had followed the family planning program, and 16.8% of their children had received ten complete doses of the basic immunization recommendation.

DISCUSSION

Maternal and child mortality is a significant public health problem, especially in developing countries, such as Indonesia (Khan *et al*, 2006; Say *et al*, 2014). WHO has stated that continuum of care (CoC) is a key strategy to address maternal and child morbidity and mortality (Spector *et al*, 2013). CoC promotes integrated maternal and child health (MCH) services, including five main aspects of MCH services, such as 4 or more antenatal care visits, skilled birth attendant, facility delivery, postnatal care, and immunization.

The results of this study indicate that most women and children did not receive MCH services continuously. This low rate of CoC completion suggests a higher risk of infant and neonatal mortality than those who complete CoC. In India, a study revealed that per 1000 live births, 37 infants and 52 neonatal mortality occurred in mothers who did not receive complete CoC (Usman *et al*, 2021). In this regard, the incompleteness of CoC occurs because of differences in education level, socioeconomic, and health insurance ownership. Women with high education and economic levels have easy access to health services and prevent the risk of pregnancy and childbirth (Kothavale and Meher, 2021). Still, the continuity of maternal health utilization in Indonesia is higher than in other low-income countries, such as Ethiopia (Chaka *et al*, 2019; Muluneh *et al*, 2020), Tanzania (Mohan *et al*, 2017), Zambia (Sserwanja *et al*, 2021), Uganda (Sserwanja *et al*, 2022), Gambia (Oh *et al*, 2020), Ghana (Shibanuma *et al*, 2018), and India (Kothavale and Meher, 2021). However, it is still lower than the coverage of the CoC for maternal health in Cambodia (Wang and Hong, 2013), Egypt (Hamed *et al*, 2018), and China (Zhao *et al*, 2020).

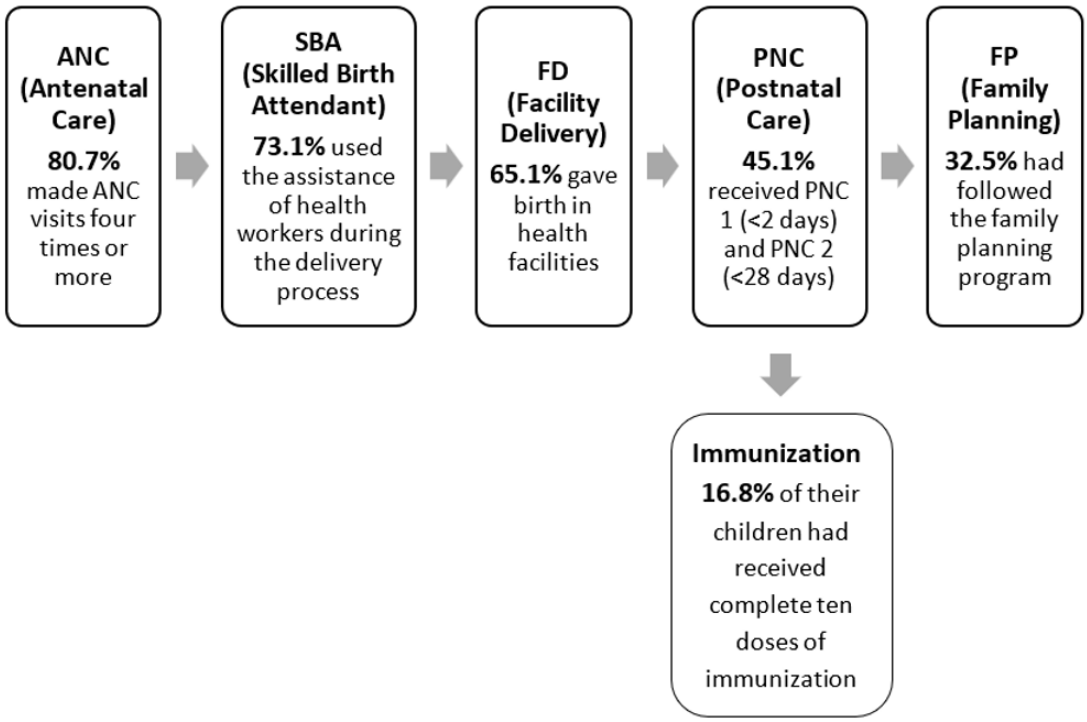

Fig 1 - Cascade of care of the continuum of care for maternal and child health

The differences in CoC levels may be contributed by several factors, such as complex interrelated factors, for instance, health systems, maternal health policies, socio-cultural variations across countries, and variations in time and data sources. Moreover, another factor that might explain the difference in the level of completion of the CoC is the difference in the level of gross national income (GNI) between these countries. GNI is positively related to the socioeconomic status of its population. It is not only completely related to the incidence of disease and unmet needs but also associated with the utilization of maternal and child health services (Girum and Wasie, 2017).

The results of this study uncovered that most women who made ANC visits are in accordance with the recommendations of the Ministry of Health (MOH RI, 2018). The recommendation for ANC visits is four times or more; that number of contact visits can increase the continuity of maternal care.

Previous studies have shown that several ANCs greater than four times are associated with increased CoC completion (Alemayehu *et al*, 2020; Kothavale and Meher, 2021). This finding also indicates that a small proportion of women did not meet the recommended minimum number of ANC visits. It might be because the women might not have access to medical facilities. The result of this study, therefore, recommends promoting visits to health facilities to increase the number of ANC contacts that further increase the CoC level.

This study also indicates that most women attended four ANC visits and received complete ANC service components using the assistance of health workers during the delivery process. This finding aligns with previous studies that women who attended four visits and received complete antenatal care had a greater opportunity to be assisted by health workers at birth attendants compared to women who did not participate in four visits or received complete antenatal components (Nyongesa *et al*, 2018; Umer *et al*, 2020). It might be because antenatal care provides an opportunity to interact with more health workers. Health workers can educate pregnant women to give birth with SBA. Pregnant women who often check-ups will also feel more comfortable and familiar with the service that they receive, thus making them more likely to use SBA (Shiferaw and Modiba, 2020).

In addition, this study uncovered that more than half of women gave birth in health facilities. Facility delivery is one of the effective interventions to reduce neonatal deaths. Facility delivery or health facilities delivery was also found to reduce the risk of neonatal death by 29% in low and middle-income countries (Tura *et al*, 2013). Previous study has revealed that facility delivery and PNC could reduce by one-third the neonatal deaths in India alone (Fadel *et al*, 2015). In Indonesia, the Indonesian Ministry of Health has set a target of achieving 85% of deliveries in health facilities by 2019 (Efendi *et al*, 2019; MOH RI, 2021). This achievement of this target requires expansion of health facilities, a supportive environment, and promotion of maternal health during childbirth, and the benefits are vital, especially in areas where home delivery is still practiced.

This study also showed that the utilization of postnatal care (PNC) in Indonesia was low but the level was still slightly higher than the utilization of PNC in poor countries, such as Uganda (Sserwanja *et al*, 2022). Nevertheless, postnatal care is an effective intervention to reduce neonatal death. Previous study has indicated that infants who did not have PNC check-ups had a higher risk of having neonatal complications after birth (Kikuchi *et al*, 2018). Study in India also uncovered that facility delivery and PNC could reduce by one-third neonatal deaths, amounting to 100,000 deaths avoided per year (Fadel *et al*, 2015). In this respect, many factors can affect PNC. One of the reasons for low PNC after delivery might be due to prevailing beliefs in Indonesian society not to bring newborns to leave the house before 40 days of birth (Sebayang *et al*, 2022). Thus, PNC coverage in Indonesia also needs to be increased to enhance the continuum of maternal health care.

In this study, the proportion of women who received a family planning program was 32.5%. This result varied from country to country, for example, 33% in Nepal to 76% in Rwanda (Singh *et al*, 2016). Postpartum family planning is defined as the prevention of unwanted pregnancy and distance in the first 12 months of pregnancy after giving birth. Family planning also allows individuals and partners to determine the desired distance time duration or limit the number of children (Gaffield *et al*, 2014). In addition, family planning has been estimated to have reduced maternal mortality levels in various countries by magnitudes ranging from 6 to 60% (Alkema *et al*, 2016; Cleland *et al*, 2012) and 44% globally (Ross and Blanc, 2012). In other words, postpartum family planning is an essential element in the continuum of care (Cleland *et al*., 2012). Hence, health workers should include family planning counseling and services during visits to health facilities as part of routine care.

Furthermore, this study exhibited that the proportion of children who received complete ten doses of immunization was low. This number is still far from the target of the WHO which is 80% coverage (WHO, 2005). Previous studies have shown that factors, such as low income, lack of access to health care, and delivery without a health worker, are associated with

low immunization coverage (Canavan *et al*, 2014; Holipah *et al*, 2018; Meleko *et al*, 2017; Phoummalaysith *et al*, 2018). Other studies revealed a positive relationship between PNC and complete immunization, ie, children whose mothers did not undergo the PNC examination had a lower probability of getting complete immunization compared to children whose mothers did the PNC examination (Abota and Atenafu, 2018; Balbir Singh *et al*, 2019; Budu *et al*, 2021; Yugbaré Belemsaga *et al*, 2018). Meanwhile, children whose mothers had PNC examinations had a higher chance of getting complete immunizations (Aregawi *et al*, 2017). This relationship occurred because the presence of women at the PNC examination enabled them to obtain important information from health workers, including information about the need for complete vaccinations (Ntenda, 2019). These findings also imply the need to improve the PNC services for women during postnatal care.

Even though this study used a nationally representative sample to assess the continuity of maternal and child health through a cascade of care approach in Indonesia, yet, this study has several limitations. First, this study used a cross-sectional approach so that the conclusions drawn from these findings were not causal. Second, this study did not include information about the quality of maternal health services received and the quality of maternal health services. Third, there is a possibility of recall bias from the continuum of elements of care data collection.

In summary, maternal and child morbidity and mortality in Indonesia occur due to a lack of maternal and child health maintenance. The researchers found that most mothers had completed antenatal check-ups, but not all of them went on to deliver with the help of a health professional, and only more than half of them gave birth in a health facility. Furthermore, only a small proportion of mothers received postnatal care and participated in family planning programs. The numbers were even lower for child immunization due to a lack of information. These findings indicate a loss of continuity of care across maternal and child health care indicators. Hence, it is necessary to increase access to and willingness to receive a continuum of care in the field of maternal and child health.

To achieve a continuum of care for maternal and child health services, these results indicate that there needs to be a national policy that focuses on equitable distribution of maternal and child health services, easy access, and reliable implementation. These policies are expected to be useful for improving antenatal care, delivery services in health facilities, postnatal care and family planning programs, including complete immunization programs for children. In addition, we also recommend to the Ministry of Health to take advantage of the great potential of social media in promoting the utilization and the integration of maternal care services to help improve the continuum of care. Future discoveries should explore regional disparities and continuums of care factors using different platforms.

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CONFLICT OF INTEREST DISCLOSURE

No potential conflict of interest was reported by the authors.

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