SUPPLEMENT ARTICLE

Presence of doctors and obstetrician/gynecologists for patients with maternal complications in hospitals in six provinces of Indonesia

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Abstract
Objective: To describe doctors’ and specialist physicians’ availability to manage obstetric complications in hospitals in six provinces of Indonesia.

Methods: Data from a nonrandomized, quasi-experimental pre-post evaluation study were used to describe the distribution of providers by each cadre of worker and assess the availability of doctors and obstetrician/gynecologists (ob/gyns) for consultations for women experiencing postpartum hemorrhage or pre-eclampsia/eclampsia, disaggregated by hospital type, province, referral status, and by time of day of provider consultation.

Results: Among hospitals that should have comprehensive emergency obstetric and newborn care (CEmONC) services available 24 hours a day, 7 days a week, many did not have a doctor available to manage obstetric complications as they presented, despite there being an average of seven ob/gyns and four doctors registered for service across all facilities. Slightly over 50% of obstetric emergency cases admitted with postpartum hemorrhage and severe pre-eclampsia/eclampsia did not receive a consultation from an ob/gyn. Among the patients who received consultations, about 70% received consultations by phone or SMS.

Conclusion: Findings from this study indicate that persistent issues of maldistribution of maternal and newborn specialists and high absence rates of both doctors and ob/gyns at CEmONC hospitals during obstetric emergencies undermines Indonesia’s efforts to reduce high maternal mortality rates.

KEYWORDS
Health facility delivery; Indonesia; Maternal health; Obstetrician/gynecologist; Provider availability

1 | BACKGROUND

Indonesia’s progress toward reducing maternal mortality showed a decline of an average of 3.5% from 1990 to 2013, but has stagnated in the last decade, with estimates ranging between 126 and 359 maternal deaths per 100 000 live births. Further improvements must still be made if Indonesia is to reach the Sustainable Development Goal of reducing the global maternal mortality ratio to less than 70 per 100 000 live births by 2030.

The two most common causes of maternal deaths in Indonesia are hypertensive disorders, including pre-eclampsia/eclampsia and postpartum hemorrhage (PPH), followed by sepsis, obstructed/
prolonged labor, and complications of unsafe abortion. The majority of these (63%) occur in a health facility. Nevertheless, maternal mortality ratio estimates vary geographically—from 222 in Java-Bali to 430 in Sulawesi—and highlight disparities in terms of infrastructure and access to basic health services between provinces. Issues around the number and maldistribution of healthcare staff as well as absence of staff and limited ability of the government to monitor the private sector are potentially contributing to Indonesia’s continuing high maternal mortality.

Healthcare providers play a critical role in health service delivery but also in the economy more broadly. On the supply side of health services, the slow production, limited availability, and uneven distribution of the health workforce—especially doctors and specialist physicians—are challenges for Indonesia. The World Health Organization (WHO), UNICEF, and UNFPA identified a package of services, known as emergency obstetric care (EmOC) that should be offered in all hospitals and health facilities to address the main causes of maternal death. Comprehensive emergency obstetric care entails EmOC in addition to having the following: an emergency room doctor on call, 24-hour operating room and surgical team on standby, 24-hour blood bank services, and defined response times of 10 minutes for emergency room, 30 minutes for delivery room, and 1 hour for blood banks.

In Indonesia, general and specialist public hospitals are funded to provide comprehensive emergency obstetric and neonatal care (CEmONC or PONEK—Pelayanan Obstetrik dan Neonatal Emergenzi Komprehensif). However, while women may have access to a CEmONC hospital, healthcare providers (both general doctors and specialists, midwives, and nurses) must be available who can manage the presenting condition. Despite increases in the recent supply of doctors and specialists in Indonesia, there are substantial staffing gaps that affect the availability of a provider to manage complications.

In 2012, the Ministry of Health (MOH) estimated that—based on unfilled positions—an additional 118,788 healthcare providers were needed at hospitals before minimum staffing levels could be met across Indonesia. This included an additional 87,874 nurses, 15,311 midwives, 3,309 general doctors, 1,382 pediatrics, 1,287 obstetrician/gynecologists (ob/gyns), and 1,295 internal medicine specialists. While the absolute number of specialists and midwives has increased since 2005, in the case of specialists, this has barely kept pace with the population growth to date. More recently, there has been a rapid increase in student admissions to private and public schools for health professionals (doctors, specialists, midwives, and nurses). However, despite larger numbers of graduates, there is still a shortage of healthcare providers at hospitals and health centers (puskesmas). One study in 15 districts in Indonesia found that the provider density (number of doctors, nurses, and midwives per 1000 population) was low by international standards—11 out of 15 districts had provider densities less than 1.0, far lower than the then WHO recommended standards of 2.3 healthcare providers (doctors, nurses, and midwives) per 1000 population. Looking to the future, the current annual increase in the number of doctors seems unlikely to meet the government’s 2019 target of one doctor per 1000 population.

Another major issue for Indonesia is the maldistribution and coverage of healthcare providers in various geographic areas. This is particularly true of the deployment of specialist physicians in rural and remote areas. According to PODES 2011 (Potensi Desa, Survey of Village Potential) survey of Indonesia’s 33 provinces, 30 did not meet the WHO recommended ratio of 1 doctor per 1000 population; however, virtually all villages in Java, the most populous island, have a doctor. While the central government has implemented a contract policy (Pegawai Tetap Tetap) to improve the distribution of healthcare providers—in particular, doctors, specialists, and midwives—across the country, geographical location of medical schools can reinforce the urban bias and maldistribution.

The absence of doctors and specialists from health facilities is another concern and can be a challenge to providing timely emergency obstetric services. Indonesia has previously been shown to have one of the highest absence rates for healthcare providers (doctors, nurses, and midwives) at 40%. A study conducted in three districts in Indonesia between 2006 and 2008 showed that there has been a significant increase in the number of healthcare providers and the proportion of permanent public servants has increased even more than the increase in total numbers. However, because doctor and midwife public servants are allowed to practice privately outside of office hours, there has also been an increase in the number of private practice facilities offering health care, potentially contributing to absenteeism from the primary place of public assignment. Another study reported that between 65% and 80% of specialist physicians’ income was derived from private practice in nonstate hospitals or private clinics. Still another study indicated that despite regulations limiting practice locations to three facilities, most specialist physicians working in a provincial capital city were working in more than three locations, with some working in up to seven locations, and spending only a few hours per week in their government hospital practice.

While guidelines are available to recommend the number and types of healthcare providers who should be available in CEmONC facilities, Indonesia’s highly decentralized health system hinders the government’s ability to regulate the private sector or to enforce policies in public facilities. The purpose of the present study was to describe doctors and obstetrician/gynecologists’ availability to manage obstetric complications in hospitals in six provinces of Indonesia, by hospital type, geographical area, and referral case.

2 | MATERIALS AND METHODS

2.1 | Procedures

A quasi-experimental pre-post control trial was conducted in the last 2 years of the Expanding Maternal and Neonatal Survival (EMAS) program (Phase 3 of the program), in six Phase 3 intervention and six comparison districts selected from the six EMAS-focus provinces. The EMAS program is fully described in the overview paper published in...
2.2 Sample

A total of 1609 clinical observations of labor and childbirth practices were completed in the 13 hospitals. Among these, a total of 521 women who experienced complications of childbirth, including PPH (n=182 cases), severe pre-eclampsia/eclampsia (n=331 cases), or suspected maternal sepsis (n=11 cases), were included in this analysis. No maternal deaths were observed.

2.3 Instruments and measures

Clinical observations of labor and childbirth practices were conducted in hospitals within each district over a 4-week period. Observations were conducted in the labor and delivery room and the emergency room and began at either the active stage of labor and proceeded until the end of the delivery or began at the onset of a prioritized obstetric emergency complication, which included referred cases. Facility staff were asked to inform clinical observers when a referred client arrived with PPH, pre-eclampsia/eclampsia, or suspected maternal sepsis, to facilitate observation of care for as many women experiencing these complications as possible.

Trained midwives with at least 2 years of experience in labor and childbirth collected data on clinical obstetric care. Direct observations were conducted in the study hospitals using a clinical observation checklist. Each clinical observer completed a week-long training in data collection and observation methods in order to promote an objective and standardized clinical observation process. Samsung (Samsung, Seoul, South Korea) tablets were used to collect clinical observation data in real time. Medical record review was not part of the process nor was verbal communication with providers or patients during the delivery process, although providers were consulted for clarification of some items, if necessary, following a birth. In addition, at the start of the 4-week observation period for each facility, a staffing checklist was completed by interviewing the individual in charge at each facility to document how many providers, by each cadre of worker, were on the staffing role for that facility.

2.4 Data analysis

We conducted an analysis of the distribution of providers by each cadre of worker, including the mean number of staff at each facility reported as an aggregate across all facilities, and by facility type (private and public). MOH public hospitals are categorized A-D, based on population served, and are staffed accordingly. Type A and B hospitals are found in districts with the largest populations with a minimum of 400 and 200 beds, respectively, and type D hospitals correspond to the smallest population and a minimum of 50 beds. Based on their volume of childbirths, in this study, private hospitals were grouped with type D facilities. We also conducted an analysis of the presence of a doctor during the admission of a patient and on consultations with an ob/gyn for each patient admitted with any of three major maternal complications (PPH, pre-eclampsia/eclampsia, or maternal sepsis), and whether the consultation occurred in person, over the phone, or by short electronic messaging (SMS). The consultation type was not mutually exclusive, and observers could mark any that applied. For example, if a consultation occurred over the phone initially and then in person, then that case received a consultation by phone and in person. We present results disaggregated by hospital type, province, referral status, and by time of day of provider consultation. Where there were enough cases to allow for analysis stratified by hospital type, province, referral status, and by time, we looked at differences in proportions using a χ² test with a level of statistical significance set at P<0.05.

Data from EMAS and comparison district facilities, and from 2015 and 2016 data collection time periods were collapsed into a single cohort, in an effort to provide a broad overview of how equipped CEmONC hospitals effectively managed the obstetric complications of interest. Importantly, the EMAS program did not directly target facility staffing directly; however, for the quasi-experimental pre-post control trial, data were collected on the numbers of providers registered at each facility. Given that only 11 cases were observed for maternal sepsis complication, disaggregated results are not shown for this specific complication.

The study team used Stata14 (StataCorp LLC, College Station, TX, USA) to manage and analyze all study data.

2.5 Ethics

This project received approval from the Indonesia MOH and National Institute of Health Research and Development (#LB.02.201/5.2/KE/213/2015) and was deemed exempt by the Johns Hopkins Bloomberg School of Public Health institutional review board (IRB No: 00005912). Data collectors obtained written permission from hospital management in each facility to conduct clinical observations of provider practices during labor and childbirth or newborn services provided in the emergency room, labor and delivery ward, or perinatal ward.

Prior to each round of data collection, the study team conducted information sessions for the heads of these units and with healthcare providers from these wards regarding the facility observation process. An information sheet explaining the purpose of observing the management of these cases was provided. A provider’s verbal consent to participate was obtained prior to the start of a clinical observation. All personnel involved with the evaluation received a session on ethical interaction with participants as part of the orientation and training schedule. Every effort was made to ensure the confidentiality of providers and the women experiencing complications.
3 | RESULTS

Across the 13 hospitals, there was a mean of seven ob/gyns (min=2, max=18), six newborn physicians (pediatricians or neonatologists) (min=2, max=16), four general practitioners (min=0, max=13), 54 midwives (min=19, max=96), five heads of emergency room (min=2, max=8), 45 nurses (min=16, max=120), and three resident doctors (min=0, max=26) registered for service at each facility (Table 1). Considerable variation was documented in the distribution of providers by province; Banten province had the highest number of ob/gyns, residents, and nurses, and West Java and North Sumatra has the highest number of general doctors.

3.1 Availability of doctors and ob/gyns for women experiencing PPH or pre-eclampsia/eclampsia complications at hospitals, by referral status

Patients referred to a hospital for the management of PPH or pre-eclampsia/eclampsia were more likely to be seen by a doctor/resident than nonreferred cases (women who were in the same hospital for a routine delivery but then developed a complication), but were equally likely to have a consultation with an ob/gyn (Table 2). However, patients referred to a hospital for the management of pre-eclampsia/eclampsia were more likely than women experiencing PPH to receive consultation, and also had higher levels of in-person consultation with an ob/gyn.

A total of 182 women experienced PPH during the period of observation (Table 2). Among the 153 who were referred to hospital with PPH, less than half (47%) of these women were admitted to a hospital where a doctor/resident was available to assist with the emergency. In contrast, among nonreferred women, that is women who were in the hospital for a normal delivery and then developed PPH, doctors/residents were present at 24% of cases when PPH developed. Among all women who developed PPH during the observation period (n=182), about half (47%) received a consultation from an ob/gyn, similar among referred cases (47%) and nonreferred cases (45%). Of these, the majority of women received a consultation with an ob/gyn over the phone or by SMS (61% and 18%, respectively), compared with in person (29%).

Of the 331 women who experienced pre-eclampsia/eclampsia during the observation period, 50% of women referred to hospital for management of this complication were admitted to a hospital where a doctor/resident was available to assist with the emergency, compared with nonreferred women, for whom doctors/residents were present at only 30% of cases when pre-eclampsia/eclampsia developed. The majority (76%) of all women with this complication received consultation by an ob/gyn. Among these, the most common type of consultation was by phone (57%), compared with in person (32%) and SMS (17%) (Table 2).

3.2 Availability of doctors and ob/gyns for women experiencing PPH and pre-eclampsia/eclampsia complications at hospitals, by hospital type

For women who experienced a PPH or pre-eclampsia/eclampsia complication, a higher proportion of patients in type B hospitals had access

| TABLE 1 | Registered healthcare providers by province, phase, and cadre of worker. |
| Province | Phase | Ob/gyn | Newborn physicians | General doctor | Midwives | Head of ER | Nurse | Resident physician | Total providers |
|----------|-------|--------|--------------------|----------------|----------|-----------|-------|-------------------|----------------|
| Banten | Phase 3 | 18 | 16 | 1 | 59 | 6 | 120 | 26 | 246 |
| Banten | Comparison | 7 | 7 | 7 | 36 | 5 | 52 | 1 | 115 |
| East Javaa | Phase 3 | 6 | 5 | 6 | 19 | 4 | 23 | 0 | 63 |
| East Java | Phase 3 | 10 | 7 | 7 | 67 | 7 | 62 | 0 | 160 |
| East Java | Comparison | 5 | 5 | 3 | 96 | 5 | 17 | 0 | 131 |
| Central Java | Phase 3 | 8 | 4 | 7 | 73 | 6 | 35 | 0 | 133 |
| Central Java | Comparison | 6 | 2 | 0 | 30 | 4 | 30 | 0 | 72 |
| West Java | Phase 3 | 6 | 5 | 13 | 69 | 6 | 62 | 0 | 161 |
| West Java | Comparison | 7 | 6 | 0 | 70 | 6 | 49 | 3 | 141 |
| North Sumatra | Phase 3 | 3 | 4 | 13 | 43 | 8 | 57 | 2 | 130 |
| North Sumatra | Comparison | 2 | 2 | 0 | 24 | 5 | 29 | 0 | 62 |
| South Sulawesi | Phase 3 | 3 | 5 | 0 | 67 | 2 | 27 | 0 | 104 |
| South Sulawesi | Comparison | 4 | 3 | 0 | 54 | 2 | 16 | 0 | 79 |
| Mean number of providers | 7 | 6 | 4 | 54 | 5 | 45 | 3 | 123 |
| Minimum number of providers | 2 | 2 | 0 | 19 | 2 | 16 | 0 | 62 |
| Maximum number of providers | 18 | 16 | 13 | 96 | 8 | 120 | 26 | 246 |

Abbreviations: ER, emergency room; Ob/gyn, obstetrician/gynecologist.

aNewborn physicians, pediatrician/neonatologists.
bIn East Java, two Phase 3 intervention hospitals were recruited, 1 private and 1 public.
to an available doctor/resident on duty, compared with just over a third in type C hospitals, and less for type D hospitals (Table 3). For women experiencing PPH, more patients (57%) in type C hospitals received consultation from an ob/gyn compared with types B (46%) or D (13%). The most common type of consultation was by phone, across all hospital types. For women experiencing pre-eclampsia/eclampsia, a higher proportion received consultation by an ob/gyn than women who experienced PPH, and this proportion was highest among type D hospitals (91%) (Table 3). Again, consultations usually occurred by phone across all hospital types; however, type B hospitals had a higher proportion of their consultations occur in person (36%), compared with type C (25%) and type D (18%) hospitals.

### TABLE 2
Availability of doctors and obstetrician/gynecologists for women experiencing postpartum hemorrhage or pre-eclampsia/eclampsia complications at hospitals, by referral status.

|                      | Referred | Not referred | Total |
|----------------------|----------|--------------|-------|
| **Women experiencing PPH** | n=153 (%) | n=29 (%) | n=182 (%) |
| A doctor/resident on duty to assist with an emergency | 73 (47.7) | 7 (24.1) | 80 (43.9) |
| A consultation with an ob/gyn occurred<sup>a</sup> | 72 (47.1) | 13 (44.8) | 85 (46.7) |
| In person | 23 (31.9) | 1 (7.7) | 24 (29.4) |
| By phone | 44 (61.1) | 8 (61.5) | 52 (61.2) |
| By SMS | 9 (12.5) | 6 (46.2) | 15 (17.6) |
| **Women experiencing PE/E** | n=281 (%) | n=50 (%) | n=331 (%) |
| A doctor/resident on duty to assist with an emergency | 140 (49.9) | 15 (30.0) | 155 (46.8) |
| A consultation with an ob/gyn occurred<sup>a</sup> | 209 (74.3) | 44 (88.0) | 253 (76.4) |
| In person | 71 (33.9) | 9 (20.5) | 80 (31.6) |
| By phone | 120 (57.4) | 24 (54.5) | 144 (56.9) |
| By SMS | 37 (17.7) | 6 (13.6) | 43 (16.9) |

Abbreviations: Ob/gyn, obstetrician/gynecologist; PE/E, pre-eclampsia/eclampsia; PPH, postpartum hemorrhage.
<sup>a</sup>The consultation type was not mutually exclusive and observers could mark any that applied. Therefore, if a consultation occurred over the phone initially and then in person, then that case received a consultation by phone and in person.

### TABLE 3
Availability of doctors and obstetrician/gynecologists for women experiencing postpartum hemorrhage or pre-eclampsia/eclampsia complications at hospitals, by hospital type.

| Type of hospital | Type B (%) | Type C (%) | Type D (%) |
|------------------|------------|------------|------------|
| **Women experiencing PPH** | n=97 (%) | n=61 (%) | n=24 (%) |
| A doctor/resident on duty to assist with an emergency | 54 (55.7) | 23 (37.1) | 2 (8.3) |
| A consultation with an ob/gyn occurred<sup>a</sup> | 45 (46.4) | 35 (57.4) | 3 (12.5) |
| In person | 14 (31.1) | 8 (22.9) | 2 (66.6) |
| By phone | 31 (68.9) | 18 (51.4) | 2 (66.6) |
| By SMS | 8 (17.7) | 5 (14.3) | 0 (0.0) |
| **Women experiencing PE/E** | n=239 (%) | n=71 (%) | n=21 (%) |
| A doctor/resident on duty to assist with an emergency | 144 (60.1) | 24 (33.8) | 5 (23.8) |
| A consultation with an ob/gyn occurred<sup>a</sup> | 175 (73.2) | 57 (80.2) | 19 (90.5) |
| In person | 65 (37.1) | 15 (26.3) | 2 (10.5) |
| By phone | 113 (64.6) | 24 (42.1) | 13 (68.4) |
| By SMS | 22 (12.6) | 9 (15.8) | 4 (21.1) |

Abbreviations: Ob/gyn, obstetrician/gynecologist; PE/E, pre-eclampsia/eclampsia; PPH, postpartum hemorrhage.
<sup>a</sup>The consultation type was not mutually exclusive and observers could mark any that applied. Therefore, if a consultation occurred over the phone initially and then in person, then that case received a consultation by phone and in person.
TABLE 4 Availability of doctors and obstetrician/gynecologists for women experiencing postpartum hemorrhage or pre-eclampsia/eclampsia complications at hospitals, by province.

| Province          | Banten (%) | Central Java (%) | East Java (%) | North Sumatra (%) | South Sulawesi (%) | West Java (%) |
|-------------------|------------|------------------|---------------|-------------------|--------------------|--------------|
| Women experiencing PPH | n=43       | n=39             | n=40          | n=9               | n=16               | n=35         |
| A doctor/resident on duty to assist with an emergency | 34 79.1 | 28 71.8 | 8 20.0 | 4 44.4 | 4 25.0 | 4 40.0 |
| A consultation with an ob/gyn occurred* | 22 51.1 | 12 30.8 | 15 37.5 | 7 77.8 | 14 87.5 | 13 37.1 |
| In person | 5 22.7 | 3 25.0 | 8 53.3 | 0 0.0 | 4 28.6 | 2 15.4 |
| By phone | 17 77.3 | 4 33.3 | 7 46.6 | 7 100.0 | 5 35.7 | 8 61.5 |
| By SMS | 1 4.5 | 5 41.6 | 0 0.0 | 0 0.0 | 5 35.7 | 3 23.1 |
| Women experiencing PE/E | n=104 (%) | n=82 (%) | n=39 (%) | n=7 (%) | n=20 (%) | n=79 (%) |
| A doctor/resident on duty to assist with an emergency | 69 66.3 | 63 76.8 | 11 28.2 | 4 57.1 | 5 25.0 | 26 32.9 |
| A consultation with an ob/gyn occurred* | 65 62.5 | 47 57.3 | 34 87.7 | 7 100.0 | 18 90.0 | 62 78.5 |
| In person | 17 24.6 | 11 23.4 | 11 32.3 | 1 14.3 | 2 11.1 | 34 54.8 |
| By phone | 55 84.6 | 36 68.1 | 20 58.8 | 6 85.7 | 6 33.3 | 22 35.5 |
| By SMS | 0 0.0 | 8 17.0 | 3 8.8 | 0 0.0 | 12 66.6 | 8 12.9 |

Abbreviations: Ob/gyn, obstetrician/gynecologist; PE/E, pre-eclampsia/eclampsia; PPH, postpartum hemorrhage.

*The consultation type was not mutually exclusive and observers could mark any that applied. Therefore, if a consultation occurred over the phone initially and then in person, then that case received a consultation by phone and in person.

PPH and pre-eclampsia/eclampsia complications. High rates of consultation occurred in person in East Java and West Java for pre-eclampsia/eclampsia complications. Consultations rarely occurred in person across all provinces, except for PPH complications in East Java and pre-eclampsia/eclampsia complications in West Java, where consultations in person occurred in around half of the cases. The majority of consultations with an ob/gyn for women experiencing PPH and pre-eclampsia/eclampsia complications occurred over the phone, except for pre-eclampsia/eclampsia complications in South Sulawesi and PPH complications in Central Java, where consultation by SMS was most common.

3.4 Availability of doctors and ob/gyns for women experiencing PPH or pre-eclampsia/eclampsia complications at hospitals, by time of admission and/or complication onset

For women with PPH complications, a doctor/resident was on duty in about half the cases with no difference observed between admission/complication onset that occurred during daytime (8:00 AM–6:00 PM) and night time (6:00 PM–12:00 AM, 12:00 AM–08:00 AM). For women with pre-eclampsia/eclampsia complications, the proportion of cases where a doctor/resident was on duty was significantly higher during the day compared with at night (49.9% vs 30.6% respectively, P<0.01). However, consultation rates with ob/gyns for both complications were just as likely to occur if the admission/complication onset occurred during the daytime or night time. Yet, consultations with an ob/gyn in person were significantly more likely to occur for cases where the admission/complication onset occurred during day hours compared with evening or night hours for both PPH and pre-eclampsia/eclampsia cases (Table 5).

4 DISCUSSION

Results from this study indicate that among hospitals that should have CEmONC services available 24 hours a day, 7 days a week, many did not have a doctor/resident available to manage PPH or pre-eclampsia/eclampsia complications as they presented, despite there being an average of seven ob/gyns and four doctors registered for service across all facilities.

In addition, for many of these cases, patients did not receive a consultation from an ob/gyn, highlighting a significant threat to ensuring that CEmONC is provided to women who expect and seek lifesaving care in a hospital. Moreover, among women experiencing PPH and pre-eclampsia/eclampsia complications, which account for the largest number of maternal deaths in Indonesia, less than half received consultations in person, with most facilities relying on a consultation with an ob/gyn over the phone, or even by SMS. While SMS and mobile phone interventions have been shown to be successful in improving coverage of prenatal care visits during pregnancy, the timeliness of referrals by helping to identify early warning signs, and timely access to EmOC through enhanced communication and transport system, we have not noted any studies that are using SMS for live consultations with specialist physicians, and can therefore not comment on its effectiveness.

Overall, women with pre-eclampsia/eclampsia complications tended to receive more specialist attention compared with women...
TABLE 5 Availability of doctors or obstetrician/gynecologists for women experiencing postpartum hemorrhage or pre-eclampsia/eclampsia complications at hospitals, by time of admission or complication onset.

|                              | Daytime: 08:00–18:00 | Night time: 18:00–08:00 | P valueb |
|------------------------------|----------------------|-------------------------|----------|
| **Women experiencing PPH**   |                      |                         |          |
| A doctor/resident on duty to | n=84 (%), 41 (48.8)  | n=97 (%), 48 (49.5)     | 1.0      |
| assist with the emergency    |                      |                         |          |
| A consultation with an ob/gyn |                      |                         |          |
| occurredb                    | 44 (52.4)            | 50 (51.5)               | 1.0      |
| In person                    | 16 (36.4)            | 5 (10.0)                | <0.01    |
| By phone                     | 24 (54.6)            | 33 (66.0)               | 0.29     |
| By SMS                       | 4 (9.1)              | 12 (24.0)               | 0.10     |
| **Women experiencing PE/E**  |                      |                         |          |
| A doctor/resident on duty to | n=162 (%), 81 (49.9) | n=175 (%), 50 (30.6)    | <0.01    |
| assist with the emergency    |                      |                         |          |
| A consultation with an ob/gyn |                      |                         |          |
| occurredb                    | 124 (76.5)           | 135 (77.1)              | 0.89     |
| In person                    | 40 (32.3)            | 22 (16.3)               | <0.01    |
| By phone                     | 63 (50.8)            | 91 (67.9)               | 0.01     |
| By SMS                       | 19 (15.3)            | 21 (15.6)               | 1.0      |

Abbreviation: Ob/gyn, obstetrician/gynecologist; PE/E, pre-eclampsia/eclampsia; PPH, postpartum hemorrhage.

χ2 statistic, P<0.05. Bold values are statistically significant.
bThe consultation type was not mutually exclusive and observers could mark any that applied. Therefore, if a consultation occurred over the phone initially and then in person, then that case received a consultation by phone and in person.

Experiencing PPH, with higher rates of consultation with an ob/gyn, particularly among women referred to hospitals for management of this complication. This may be explained by the differences between the clinical presentation, development, and management of these complications, with pre-eclampsia/eclampsia typically progressing more slowly and managed through ongoing monitoring and intervention, while PPH is usually a more urgent and rapid diagnosis requiring an immediate response. Therefore, it is not surprising that women who were referred to hospital for the management of pre-eclampsia/eclampsia were more likely to have either a doctor/resident available or be consulted by an ob/gyn compared with PPH cases that were referred, as providers usually had more time to attend this complication. Nevertheless, the low rate of doctor/resident on duty for nonreferred cases (25%) highlights a major challenge with ensuring provider availability when it is most needed.

The three delays model by Thaddeus and Maine describes delays to timely treatment of obstetric complications to prevent deaths; it proposes that pregnancy-related mortality is overwhelmingly due to delays in: (1) deciding to seek appropriate medical help for an obstetric emergency; (2) reaching an appropriate obstetric facility; and (3) receiving adequate care when a facility is reached. Results from this study highlight the need for interventions and activities that ensure these facilities minimize the third delay by ensuring providers are available when complications occur.

While the EMAS program did not directly target provider availability or facility staffing directly, results indicated that when hospitals received a referral notification in advance of the women arriving at the hospital, they were more likely to arrange a consultation with an ob/gyn in person (the preferred method) over consultation via phone or SMS. These results may be demonstrative of the effects of the EMAS program, whereby referral interventions aimed to increase the efficiency and effectiveness of referral pathways for emergency complications through the use of a district-wide referral network memorandum of understanding, and an automated electronic referral exchange system, SijariEMAS, that enabled puskesmas and private midwives to send a two-way message (via phone/call center, SMS, or mobile or web application) to a central server prior to referral that would automatically route that referral to the most appropriate hospital. Consultations with ob/gyns were also significantly more likely to occur in person during daytime hours compared with evening or night hours for complications of both PPH and pre-eclampsia/eclampsia. These results may indicate a resourcing and staffing issue, given that all the included hospitals were equipped to provide CEmONC services and had multiple ob/gyns registered to provide services at each facility. These findings clearly highlight an issue around the absence of providers and the nonresponsiveness of specialists in public facilities where they are registered. In line with previous studies that have provided evidence for the increasing impact of the private sector on pulling providers from public facilities, this study provides further evidence of the nonresponsiveness and the absence of specialists in hospitals where they are registered, possibly due to working in the private sector. Variation across provinces was clear, with higher rates of consultations with an ob/gyn occurring in North Sumatra (78%–100%) and South Sulawesi (88%–90%), compared with Java provinces (31%–88%). Importantly, while overall coverage of consultations with an ob/gyn was lower among the hospitals in the Java provinces compared with the more rural provinces of North Sumatra and South Sulawesi, consultations were more likely to occur in person in the hospitals across Java, again, highlighting the persistent issue of uneven distribution of specialists.
across Indonesia. The present paper highlights issues with provider availability and the provision of EmOC, which is further supported by results from the maternal death review by Baharuddin et al. in this Supplement, in which the absence of ob/gyns from health facilities was identified as a contributing factor in 88% of the 90 cases reviewed.

Results from the present study support previous findings from other studies that highlight maldistribution of specialist physicians and absence rates for health staff at 40% as significant challenges to hospitals in Indonesia. These challenges are not unique to Indonesia. A study conducted in Bangladesh found an absence rate of 40% for doctors in subdistrict-level hospitals and 74% in health centers. A study in 78 CEmONC facilities across Afghanistan found that only 49% reported having at least one ob/gyn on staff while 95% had at least one medical doctor on staff. This study also found that ob/gyns, pediatricians, and surgeons were more likely to be on call than actually available on site, and that in many cases, they were not available at various times and days. In this same study, among facilities that had an ob/gyn on staff, the physical on-site presence of an ob/gyn ranged from 47% during daytime hours through the work week to 13% during nighttime hours on the weekend. Only 32% of facilities with ob/gyns on staff reported having those providers available during night shifts, leaving facilities with no specialist coverage available on site at night, while 36% of facilities had this essential cadre on call.

Findings from our study indicate that both the distribution and availability of specialist doctors need to be improved to ensure appropriate levels of coverage in CEmONC hospitals across Indonesia. Absence rates of both doctors and ob/gyns at hospitals included in our study were high, and consultations with specialists rarely occurred in person, highlighting how current regulatory policies and financial incentives have not been effective in addressing the maldistribution of specialist doctors and ensuring the presence of an ob/gyn when complications occur.

In addition, while Indonesia continues to encourage women to deliver in hospitals, ensuring that appropriate providers are available and ready to respond in the event of a complication is critical to reduce maternal mortality, which has stagnated over recent years. Similar challenges have been observed across South Asia, in particular India, where the government has successfully encouraged more women to deliver in facilities but has not been able to ensure high quality of care. A broader and more integrated policy approach including more innovative service delivery strategies for rural and remote areas is needed.

4.1 Limitations

The EMAS evaluation study utilized a nonrandomized quasi-experimental design, rather than a randomized control trial design. Nonrandom selection of facilities introduced the risk of selectivity bias in the quasi-experimental EMAS study, which influenced the analysis techniques used. However, as this study aimed to provide a descriptive overview of provider availability across hospitals in Indonesia, selection bias was minimized by collapsing both intervention and comparison sites together.

This small number of cases (sample size), especially when stratified by complication types, hospital type, referral status, and observation time, limited our ability to undertake any inferential analyses owing to low statistical power to find a significant difference. Also, as the primary outcome of the original evaluation study was not to assess provider staffing, only limited additional information was collected around reasons for the absence of doctors and specialists or lack of consultation. Specifically, the observational checklist did not aim to classify or quantify the severity of each observed complication, which may have had an impact on the decisions as to when an in-person specialist consultation was needed for each PPH or pre-eclampsia/eclampsia complication observed. However, all observations occurred in hospitals designated as CEmONC facilities, which should have an emergency room doctor on call or available at all times. Observers were located in the emergency waiting rooms and labor and delivery rooms within hospitals to maximize the opportunity to identify all women who experienced pre-eclampsia/eclampsia, PPH, or sepsis. Observers also asked staff to alert them to instances when any of these complications occurred; however, there is the potential that facility staff or observers may have missed certain occurrences, potentially introducing some bias toward more or less severe cases being observed.

5 CONCLUSION

Findings from the present study indicate that persistent issues of maldistribution of maternal specialists and high absence rates of both doctors and ob/gyns at the CEmONC hospitals during obstetric emergencies continue to undermine Indonesia’s efforts to reduce high maternal mortality rates. To address this issue, additional information should be collected to better understand factors that may affect provider availability at CEmONC hospitals, including facility-level management and policies and the potential influence of the growing private sector in luring away specialists from their duties at government hospitals.

AUTHOR CONTRIBUTIONS

AP led the design, planning, oversight, data analysis; MT and SQ contributed to the design, planning, oversight, data analysis; RS contributed to the planning. SA conducted statistical analyses and all authors contributed to manuscript writing and/or review.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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