

What are the Staffing Levels and Maternal Outcomes? A Descriptive Study in Referral Hospitals in Java, Indonesia

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ABSTRACT

Adequate maternity staffs (obstetric/gynecologists, midwives, and nurses) at referral hospitals are crucial to manage obstetric complications and to improve maternal outcomes. This study aims to describe the staffing levels and maternal outcomes in selected referral public hospitals in Java region of Indonesia. The data of 8,396 deliveries with live birth and 522 maternity staffs were collected from six referral hospitals in Java, Indonesia. Descriptive statistics were employed to summarize the study subjects. The maternity staffing levels of the study hospitals were relatively sufficient, however, the maternal mortality ratio and the severe maternal outcome ratio are moderately high. Further studies are recommended to understand the effect of staffing and other possible factors on maternal outcome.

Keywords: *maternal, midwife, nurse, referral hospital*

Introduction

Maternal mortality is the second highest cause of death among women of reproductive age with nearly eight hundreds women died every day from maternal causes.¹ In addition maternal morbidity is experienced by approximately twenty million women around the world that leads to death and disability without prevention or appropriate treatment.² Considering the magnitude of this issue, improving maternal health continuously receive a major concern from the global stakeholder. The Sustainable Development Goals set a target to reduce the maternal mortality ratio by 70 deaths per 100,000 live births by 2030.³

Despite the declining trend of maternal mortality ratio (MMR), Indonesia is among other developing countries with a high number of maternal deaths. Based on the national population census reports, the MMR has been reduced from 390 per 100,000 live births in 1991 to

305 per 100,000 live births in 2015.⁴ This achievement is in line with the increase proportion of skilled birth attendance. By 2015, the percentage of skilled birth attendance has exceeded the national target at 93.1%.⁵ However, approximately 20.5% of births are delivered at home.⁵

Skilled birth attendance at health care facilities is a key strategy in Indonesia to prevent delays in managing obstetric emergencies. Based on the 2012 Indonesian Demographic and Health Survey, more than 80% of maternal deaths occur in hospitals.⁶ It indicates that women with obstetric complications may not arrive timely at the hospital or may receive inadequate treatment while in the hospitals. The Government of Indonesia stated that delays in making decision to seek care, making referral to health facilities, and managing obstetric emergency care due to constraints in infrastructure and human resources are among contributing factors to maternal mortality.⁷

Health workforce is a central component within the health system. To improve maternal health, appropriate staffing has been strongly recommended by policy makers from international and national institutions. This policy is partly supported by evidence, as various studies have reported the significant relationship between higher staffing

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and positive health outcome.⁸ A previous review study reported that shortage of health workers and imbalance distribution occur in various public health facilities in Indonesia.⁹ This study, therefore, aims to describe the staffing levels and maternal outcomes in several referral public hospitals in Java region of Indonesia.

Method

Study Design, Setting, and Sampling: This study employed an observational study design using the retrospective data from the hospital administrative electronic database. The hospital study location was purposively selected based on the similarity of structural characteristics of the hospitals. Data of obstetric patients and maternity staffs were collected from six referral hospitals with eleven maternity wards within Java region, Indonesia from September to December 2017. The study employed the total sampling technique to capture data of all study subjects. We included all deliveries with live birth (single and multiple births). Stillbirth and incomplete data of deliveries were excluded from the data analysis.

Study Variables: Nursing staffs included registered nurses and diploma nurses, while midwifery staffs consisted of professional midwives and diploma midwives. Variables of staffing levels will be presented as an aggregate at the maternity unit level, including:

1. Nurse to patient: number of nursing staffs per 1000 patient/year.
2. Midwife to patient: number of midwifery staffs per 1000 patient/year.
3. Maternity staffs to patient: number of nursing and midwifery staffs per 1000 patient/year.
4. Proportion of nurses and midwives with bachelor degree.
5. Average years of nursing experience.
6. Average years of midwifery experience.
7. Proportion of permanent staffs.

One variable of the staffing level of obstetrician/gynecologist (ob/gyn) is presented in ratio per 1000 patient/year at the hospital level.

Variables of maternal outcomes represented the outcome of obstetric patients that are categorized as follows:

1. **Death:** women who died in the hospital from maternal causes
2. **Near-miss:** women who almost died from maternal conditions within 42 days after the pregnancy terminated
3. **Survive:** women who are alive at the time of discharge from hospital.

Other variables represented the characteristics of obstetric patients include:

1. Age
2. Place of residence:
 - Same city : the patients were residents of the city where the hospital located.
 - Other city: the patients were residents of other cities.
3. Admission procedure: referral and non referral.
4. Payment scheme: insurance and out of pocket.
5. Types of delivery: vaginal spontaneous delivery, instrumental delivery, caesarean section, and other assisted delivery.
6. Types of live birth: single and multiple
7. Length of stay: days of hospitalization calculated from the day of admission to the day of discharge.
8. Type of maternal complications underlying causes of morbidity and mortality.

Data Analysis

Descriptive statistics method was employed to analyze the data to generate the study results in forms of frequencies, percentages, mean, ranges, and standard deviation. This method allowed to summarize the characteristics of the study subjects based on the variables selected.

Results

The data of 8,396 patients with live birth deliveries and 522 maternity staffs (medicine, nursing, and midwifery staffs) were obtained from six hospitals. Table 1 displays the statistics summary of variables of staffing levels. The mean nursing staffing level at maternity unit was 26.1 nurses per 1000 patient in a year. The average

midwifery staffing level at maternity unit was 21.8 midwives per 1000 patient per year. The maternity staffs showed an average ratio of 47.9 staffs to 1000 patient per year. The proportion of nurses and midwives holding bachelor degree in maternity units was ranging from 2.0% to 57.4%, with 25.0% at the average. The average years

of experience between nursing staffs and midwifery staffs per maternity unit were quite similar at 11.1 years and 11.3 years respectively. The mean of the proportion of permanent staffs at the maternity unit was 74.3%. At the hospital level, the mean of the staffing level of ob/gyn was 13.6 ob/gyn per 1000 patient in a year.

Table 1: Descriptive statistics of staffing levels by maternity unit

n = 11

Staffing levels	Minimum	Maximum	Mean	SD
Nurses to patient	5.0	45.4	26.1	15.09
Midwives to patient	7.1	50.7	21.8	12.24
Maternity staffs to patient	27.8	66.2	47.9	15.32
Proportion of nurses and midwives with bachelor degree	2.0	57.4	25.0	18.74
Average years of nursing experience	2.7	21.6	11.1	5.74
Average years of midwifery experience	6.7	26.0	11.3	5.23
Proportion of permanent staffs	34.9	100.0	74.3	22.42
Ob/gyn to patient*)	6.1	29.9	13.6	8.86

*) calculated at hospital level

Table 2 presents the characteristics of obstetric patients included in this study. The mean age of the study subjects was 29.8 years old. Most of patients (67.1%) were residents of the city where the hospital located. Admission to the hospital were mostly through medical referrals (74.5%). Insurance was the most payment scheme utilized by the patients (84.7%). Surprisingly, although most deliveries were single live birth (98.5%), more than half deliveries were conducted through Caesarean section. Majority of patients (83.9%) were reported to have maternal complications. The mean length of stay in the hospital was 4.2 days. While most maternal outcomes (97.2) were positive, 15 patients died and 221 patients experienced near-miss events.

Table 2: Characteristics of obstetric patients

N = 8,396

Variables	Number (%)	Mean ± SD
Age	-	29.8 ± 6.52
Place of residence		
Same city	5,632 (67.1)	
Other city	2,764 (32.9)	
Admission procedure		
Self-referral	2,138 (25.5)	
Medical referral	6,258 (74.5)	
Payment scheme		
Out of pocket	1,288 (15.3)	
Insurance	7,108 (84.7)	

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Types of delivery		
Vaginal spontaneous	3,088 (36.8)	
Instrumental	471 (5.6)	
Caesarean section	4,837 (57.6)	
Type of live birth		
Single	8,266 (98.5)	
Multiple	130 (1.5)	
Complications		
No	1,354 (16.1)	
Yes	7,042 (83.9)	
Length of stay	-	4.2 ± 2.93
Patient outcome		
Death	15 (0.2)	
Near-miss	221 (2.6)	
Survive	8,160 (97.2)	

Table 3 shows the outcome of patients who experienced maternal complications (n=7,051). Most of the underlying causes of maternal mortality and near-misses were complications predominantly related to puerperium and other conditions at 40% and 24.4% respectively. Overall, maternal complications were dominated by conditions specified in the group of other maternal care related to fetus and amniotic cavity and delivery problems (36.4%).

Table 3: Types of maternal complications by patient outcome n = 7,051

Maternal complications	Patient outcome, N (%)			
	Death	Near-misses	live	Total
Oedema, proteinuria, and hypertensive disorder	1 (6.7)	44 (19.9)	1,454 (21.3)	1,499 (21.3)
Placenta praevia, premature separation of placenta and antepartum haemorrhage	1 (6.7)	26 (11.8)	231 (3.4)	258 (3.7)
Other maternal care related to fetus and amniotic cavity and possible delivery problems	2 (13.3)	53 (24.0)	2515 (36.9)	2570 (36.4)
Obstructed Labour	0 (0.0)	4 (1.8)	188 (2.8)	192 (2.7)
Postpartum haemorrhage	0 (0.0)	3 (1.4)	30 (0.4)	33 (0.5)
Other complications of pregnancy and delivery	5 (33.3)	29 (13.1)	1582 (23.2)	1616 (22.9)
Complication predominantly related to puerperium and other conditions	6 (40.0)	54 (24.4)	666 (9.8)	726 (10.3)
Other not specified complications but may affect the maternal outcome.	0 (0.0)	8 (3.6)	149 (2.2)	157 (2.2)
TOTAL	15	221	6,815	7,051

Discussion

Our study showed that the mean of staffing levels of nurses is slightly higher than the staffing levels of midwives. The minimum ratio and the maximum ratio have a wide range in both nursing and midwifery staffing levels, but narrower range in the maternity staffing level at 47.9 staffs per 1000 patients a year. This finding implies that nursing and midwifery staffs in maternity units may have substitution roles. The availability of ob/gyn in referral hospitals is crucial. In our study, there was a wide range of ob/gyn staffing level among the study hospitals from 6.1 to 29.9 ob/gyn per 1000 patients per year, with an average of 13.6 ob/gyn per 1000 patients a year. A previous study in England, reported that the mean for each maternity staffing levels was 29.6 midwives, 1.4 consultant ob/gyns, and 4.3 junior ob/gyns per 1000 deliveries a year.¹⁰

In Indonesia, the staffing in the maternity unit is determined based on the hospital classification. Referral hospitals of type A and type B are recommended to have the staffing ratio of one nurse or midwife per patient.¹¹ This regulation implies that at the secondary or tertiary referral level of care every patient should be attended by either a nurse or a midwife at all shifts. Other countries such as the United Kingdom and Australia also had different recommendation related to the optimum maternity staffing. The UK suggested 36 midwives per 1000 births to manage one to one care throughout the childbirth process and other period of care.¹² In Australia,

the suggested staffing levels in maternity inpatient units were one midwife or nurse for every five patients on a day shift and for every eight patients on the evening shift.¹³

In this study, the mean of the proportion of staffs with bachelor degree in maternity units was 25%, while both the mean years of nursing experience and midwifery experience were quite similar at approximately eleven years. Previous studies reported the significant factors of staffs educational background and the duration of staff experience to the improved patient outcome.¹⁴ A previous study reported that the likelihood of patients dying was 30% lower in the hospitals with 60% of staffs with bachelor degree in nursing than in hospitals with only 30% of nursing staffs with bachelor degree.¹⁵

The average age of obstetric patients in this study was 29.8 years old, insurance users, and mostly admitted through the referral procedure. Most of patients were having maternal complications which may indicate the reason for accessing the referral level of care. This finding is not surprising, considering the data of this study was taken from the 2016 hospital database which was the second year of the implementation of the National Health Insurance system. The system may have contributed to the increasing access of women with maternal complications to referral health facility.

Our study showed that the maternal mortality ratio was 178.8 per 100,000 live births. According the World Health Organization (WHO), the MMR is categorized as moderately high if the range falls between 100 to 299

maternal deaths per 100 000 live births. The MMR in this study is found to be lower than the present MMR at the national level which is probably due to the small sample size and only conducted in one region. The severe maternal outcome (deaths and near-misses) ratio was 28.2 per 1000 live births. This finding is higher than the ratio reported in a previous study in Brazil at 11.08 per 1000 live births.¹⁶

Most of underlying causes of maternal deaths and near-miss events in this study included puerperal complications, other complications of pregnancy and delivery (including intrapartum haemorrhage and preterm labour), other maternal care related to fetus and amniotic cavity and possible delivery problems, and hypertensive disorder. According to WHO, most of the causes of maternal deaths can be prevented through effective interventions including antenatal care, intranatal care, and postnatal care.¹ These interventions aim to ensure that every pregnant woman is physically and mentally healthy throughout pregnancy and deliver a healthy baby. Effective maternal health care services require adequate and competent health providers.

Conclusion

The staffing level is an essential component to deliver quality of care. The mean of staffing levels of nursing, midwifery and obstetric/gynecology in this study indicated sufficient staffs available at the referral facilities. However, the maternal mortality ratio and the severe maternal outcome ratio are still moderately high indicating that other factors may have influential contribution. Further studies are strongly recommended to explore the relationship between staffing and maternal outcomes by incorporating other possible factors that may affect the association.

Ethical Clearance: The ethical approval for this study was granted by the IRB committee of the Faculty of Nursing at the Airlangga University in 2017.

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