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Assessment of knowledge of evidence-based maternal and newborn care practices among midwives and nurses in six provinces in Indonesia

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Abstract

Objective: To investigate knowledge of obstetric and newborn care guidelines among midwives and nurses in Indonesia, whether knowledge differs between health centers (*puskesmas*) and hospitals, and factors associated with knowledge.

Methods: Cross-sectional knowledge assessments of 409 health workers in 56 public and private health facilities across six provinces were conducted. Poisson regression models examined relationships between knowledge; health workers' age; in-service education about labor, delivery, or newborn care in the past 3 years; and supervision in the past 3 months.

Results: The mean maternal care score among the 302 midwives for the 10 questions was 3.3 (standard deviation [SD]1.8). Hospital midwives performed slightly better than *puskesmas* midwives: 3.8 correct (confidence interval [CI], 3.43–4.19) vs 3.0 correct (CI, 2.77–3.26), which was a statistically significant difference. The mean knowledge score for three newborn care questions was 0.79 (SD 0.87). There was no statistically significant difference in scores between hospital workers and *puskesmas* providers (0.80 correct [CI, 0.64–1.00] vs 0.78 correct [CI, 0.67–0.92]). Receipt of supervision was not associated with maternal or newborn health knowledge scores.

Conclusions: There is a need to improve knowledge of maternal and newborn care guidelines among midwives and nurses in Indonesia.

KEYWORDS
Indonesia; Knowledge; Maternal; Midwives; Neonatal; Nurses

1 | INTRODUCTION

Indonesia has one of the highest maternal mortality ratios in Southeast Asia. The most recent Intercensal Population Survey (2015) indicates a maternal mortality ratio of 305 deaths per 100 000 live births while the estimate from the Demographic and Health Survey (2012) is 359 deaths per 100 000 live births (with a range between 239 and 478 deaths per 100 000 live births).[1,2] The most common causes of maternal deaths in Indonesia are hypertension in pregnancy and postpartum hemorrhage.[3] The Demographic and Health Survey (2012) estimate for newborn mortality rate is 19 deaths per 1000 live births, which is virtually unchanged from 2002.[2] The most common causes of newborn deaths are prematurity, birth asphyxia and trauma, congenital anomalies, and sepsis.[4]

A key approach to reducing maternal and newborn morbidity and mortality has been to increase the proportion of births

that occur with skilled birth attendants (SBAs).[5] The World Health Organization (WHO) states that SBAs are "competent maternal and newborn health (MNH) professionals educated, trained and regulated to national and international standards. They are competent to: (1) provide and promote evidence-based, human-rights-based, quality, socioculturally sensitive and dignified care to women and newborns; (2) facilitate physiological processes during labor and delivery to ensure a clean and positive childbirth experience; and (3) identify and manage or refer women and/or newborns with complications".[6] Indonesia has focused on improving coverage of SBAs, which is now high at 83%, with 62% of births attended by a nurse, midwife, or village midwife; 20% by obstetricians; and 1% by general doctors.[2] Training programs have focused on ensuring that SBAs can deliver specific interventions to prevent maternal and newborn deaths, including treatment with corticosteroids during pre-term labor, use of a partograph to monitor labor, provision of a uterotonic to prevent postpartum hemorrhage, treatment with magnesium sulfate to prevent and control eclampsia, emergency obstetric care for maternal complications including uterotonics to treat postpartum hemorrhage, and newborn resuscitation, all of which can be provided by SBAs.[7,8]

In Indonesia, public health care within districts is provided through a network of health centers, or *puskesmas*, and hospitals. *Puskesmas* are the center of primary care and refer clients to hospitals in the event of complications.[9] Under Indonesia's universal health coverage plan (*Jaminan Kesehatan Nasional*), a patient must first seek care through the *puskesmas* network before being referred to a hospital for further treatment, except in an emergency.[10]

While a high percentage of women already seek childbirth services in health facilities, there are concerns that the care they receive at the facility is not always of high quality. Indonesia's high maternal mortality ratio and the most common causes of death have been associated with low-quality health services.[11] An assessment of maternal mortality in five regions in Indonesia found that 41.9% of mothers died at public hospitals and another study in Nusa Tenggara Timur found that 65% of newborn deaths occurred in hospitals.[11,12] A readiness assessment of public health facilities found that PONED (*Pelayanan Obstetri dan Neonatal Esensial Dasar*) *puskesmas*, which are responsible for providing basic emergency obstetric and newborn care, generally do not have the necessary resources, equipment, and staff capacity and skills to manage and treat obstetric and newborn emergencies.[13]

There is limited information on Indonesian health workers' knowledge of obstetric and newborn care practices. Mahmood et al.[14] reviewed 30 maternal deaths that occurred in Kutai Kartanegara in East Kalimantan province. Their findings suggested that health workers played a role in all of the deaths owing to inadequate knowledge and skills and failure to follow best practices. However, their study did not include a formal assessment of knowledge and their conclusion was based on reviews of clinical records and interviews with health workers.

The purpose of the present study was to investigate knowledge of obstetric and newborn care guidelines among midwives and nurses in Indonesia, including assessing the differences in knowledge between healthcare providers in *puskesmas* and hospitals and to identify individual and structural factors associated with knowledge of obstetric and immediate newborn care guidelines.

2 | MATERIALS AND METHODS

2.1 | Procedure

The study team conducted a secondary analysis of survey data obtained from the Expanding Maternal and Neonatal Survival (EMAS) program. The program, which was conducted from September 2011 to March 2017, is described in detail in a companion article.[15] While there was no direct intervention to increase health worker knowledge in the EMAS program, mentoring sessions and clinical performance standards promoted the Indonesian obstetric and immediate newborn care guidelines, which follow WHO guidelines. Provider knowledge was assessed to help understand the context in which the program was operating. The study included interviews with health workers from *puskesmas* and hospitals across Indonesia. Health workers were individually interviewed about work experience and knowledge of evidence-based practices for maternal and newborn care.

2.2 | Sample

A total of 409 midwives and nurses (199 from *puskesmas* and 210 from hospitals) who provide obstetric and/or newborn services in 56 public and private health facilities across six provinces in Indonesia were interviewed in 2015. These facilities included 22 hospitals and 34 *puskesmas*.

An inventory form was used to identify hospital-based physicians, midwives, and nurses who provided labor, childbirth, and perinatal services. A maximum of eight healthcare providers who perform labor and birth and newborn services were interviewed in each hospital. A maximum of three healthcare providers were interviewed in each *puskesmas*. Three midwives staffing the labor and delivery ward and three nurses working in the perinatal wards were randomly selected in each hospital and invited to participate in the health worker interviews. Random selection within the same cadre continued until the sampling frame was filled with voluntary participants. A similar process was used to interview staff in the *puskesmas*. Healthcare providers who did not provide obstetric care and/or newborn care were excluded from the sampling frame.

2.3 | Instruments

The health worker interview tool was adapted from the quality of care survey tools developed by the Maternal and Child Integrated Program (MCHIP), which were developed and used in several countries, including Ethiopia, Kenya, Madagascar, and Tanzania.[16] The interview tool was modified for the Indonesian context. The questions related to management of labor and birth were asked of midwives in *puskesmas* and hospitals. Questions related to immediate newborn care were asked of midwives in *puskesmas*, but only nurses in hospitals, since midwives are not assigned to newborn wards in hospitals.

TABLE 1 Health worker knowledge questions.

Question	Answer
Obstetric care questions asked of midwives	
Routine delivery care	
• Of the list of procedures I am going to read you, please tell me which procedures are carried out routinely for all patients during labor and delivery	a. Active management of third stage of labor b. Maternal blood pressure monitoring c. Fetal heart rate monitoring Score=1 if options a, b, and c were mentioned
• What are the key steps in the active management of the third stage of labor?	a. Injection of uterotonic within 1 min of delivery b. Controlled cord traction c. Check uterine tone and massage when soft Score=1 if options a, b, and c were mentioned
• When should the amniotic membrane be broken by the healthcare provider?	Score=1 if "not to be broken" is mentioned
Pre-term labor	
• What is the action that should be taken for a pregnant woman who is 32 weeks gestational age with regular contractions, 3 cm dilated, and with an intact amniotic membrane?	a. Provide antenatal corticosteroid b. Provide dexamethasone c. Monitor the condition of the mother and baby Score=1 if options a and c were mentioned OR if options b and c were mentioned
Postpartum hemorrhage	
• What are the appropriate actions if a woman comes in with bleeding or starts to bleed postpartum due to uterine atony?	a. Fundal massage b. Give uterotonics intramuscularly (IM) or intravenously (IV) c. Perform bimanual compression of uterus d. Start IV fluids Score=1 if 3 or more options were mentioned
Pre-eclampsia	
• What action should be taken when managing a woman with severe pre-eclampsia at term?	a. Provide MgSO4 b. Provide an antihypertensive drug Score=1 if options a and b were mentioned
• Case scenario: A woman is brought to the emergency department of the district hospital by her husband after she complained of a severe headache and blurred vision. She is 20 years old, this is her first pregnancy, and she is 37 weeks gestational age. She had 2 antenatal care visits and no problems. She denies upper abdominal pain or decreased urine output, and fetal movement is normal. Her blood pressure is 160/120. Her examination is normal. She has contractions 2 in 10 minutes, lasting 20 seconds by palpation. Her urine has 3+ protein Given the information presented above, what is your working diagnosis?	Score=1 if severe pre-eclampsia was mentioned
Obstructed labor	
• Can you explain the signs of obstructed labor?	a. No advance of the presenting part despite strong uterine contractions b. Slow or no dilatation of the cervix despite strong uterine contractions c. Bandl's Ring Score=1 if 1 or more options were mentioned
• Can you explain the possible outcomes of obstructed labor/dystocia?	a. Infection b. Ruptured uterus c. Fistula d. Stillbirth e. Asphyxia f. Newborn death Score=1 if 3 or more options were mentioned
Sepsis	
• Please tell me which antibiotics to give to a woman who is diagnosed with postpartum endometritis following a vaginal delivery?	a. Ampicillin b. Gentamicin c. Metronidazole Score=1 if options a, b, and c were mentioned

(Continues)

TABLE 1 (Continued)

Question	Answer
Immediate newborn care questions asked of midwives and nurses	
• What basic equipment and supplies must be available to ensure the baby receives appropriate immediate care after birth?	a. 2 dry warm cloths b. Sterile knife or scissors/blade c. Sterile tie d. Source of warmth e. Self-inflating bag f. Baby mask 1 g. Baby mask 2 Score=1 if 3 or more options were mentioned
• Please tell me, when a baby is delivered and there is no complication, what care is important to give them immediately after birth and in the first hour?	a. Ensuring the baby is breathing/crying b. Providing temperature protection (skin-to-skin care) c. Ensuring early initiation of breastfeeding d. Examining the baby within 1 hour e. Weighing the baby f. Providing eyedrop antibiotic for prophylaxis + cutting umbilical cord with knife or scissor Score=1 if 3 or more options were mentioned
• Can you please tell me the signs and symptoms of severe infection (sepsis) in a newborn?	a. Not able to feed/stopped feeding well (attachment and suckling or finger test) b. Fast breathing (with a timer/watch and count for 1 full minute) c. Temperature (to look for hypo- or hyperthermia) d. Hyperthermia e. Convulsions or fits f. Pus/redness around umbilicus g. Skin pustules h. No movement or movement only with stimulation Score=1 if 3 or more options were mentioned

2.4 | Ethics

The study received approval from the Indonesia Ministry of Health, National Institute of Health Research and Development #LB.02.201/5.2/KE/213/2015. Informed consent was obtained from all health workers who agreed to participate in the interview.

2.5 | Data analysis

Data were analyzed using Stata version 14 (StataCorp LLP, College Station, TX, USA). The proportion of respondents who provided a correct answer was calculated per question. Correct responses were determined by clinical experts from the EMAS program, including staff from Budi Kemuliaan Hospital in Jakarta, and were based upon national clinical standards. A score was then developed for the obstetric care knowledge questions (total number of correct responses divided by the total number of questions [n=10]) and the newborn care questions (total number of correct responses divided by the total number of questions [n=3]) listed in Table 1. Design-based bivariate and multivariable Poisson regression models that adjusted standard errors for health facility clustering were used to examine the difference in knowledge levels between *puskesmas* and hospital health workers and to examine the association between knowledge scores and health workers' age, qualifications (nurse or midwife), attendance at an in-service training for labor and childbirth or newborn care in the past 3 years, and receipt of supervision in the past 3 months. Significance was set at $P<0.05$.

3 | RESULTS

All participants were female, with three-fourths of providers under the age of 40 (75.2%). More than three-fourths of the respondents were midwives (76.8%) and the remainder were nurses (23.2%) (Table 2).

Table 3 presents responses for each of the maternal knowledge questions. Only midwives responded to these questions and the difference in the proportions of midwives who responded correctly is presented by facility type. Most midwives (94.7%) in both *puskesmas* and hospitals were able to correctly name the procedures that are carried out routinely for all patients during labor and childbirth (routine childbirth care). Only slightly more than half of the midwives were able to name the correct actions that should be taken for a woman at term with severe pre-eclampsia (56.0%) and the appropriate action to take if a woman has uterine atony (57.9%). Only 43.4% of midwives could name all three steps involved in the active management of the third stage of labor (AMTSL). None of the *puskesmas*-based midwives could accurately answer the case scenario question related to severe pre-eclampsia, in contrast to 91.5% of hospital-based midwives who could correctly answer the same case scenario question. Few midwives in either hospitals or *puskesmas* were able to correctly answer questions related to the signs and possible outcomes of obstructed labor (16.6% and 5.6%, overall respectively, with no statistically significant difference in knowledge by facility type). Among the 302 midwives who offered childbirth services in the selected facilities, the mean maternal health score for the 10 questions was 3.3 (SD 1.8). Hospital-based

TABLE 2 Health facility and health worker characteristics.

	Puskesmas	Hospitals	Total
Health facilities	n=34	n=22	n=56
Affiliation			
Private	0	4	4
Public	34	18	52
Province			
Banten	4	2	6
Central Java	6	4	10
East Java	6	5	11
North Sumatra	6	3	9
South Sulawesi	6	4	10
West Java	6	4	10
Health workers	**n=199**	**n=210**	**n=409**
	n (%)	**n (%)**	**n (%)**
Age, y			
<29	60 (30.1)	67 (31.9)	127 (31.0)
30–39	64 (32.2)	117 (55.7)	181 (44.2)
40–49	64 (32.2)	22 (10.5)	86 (21.0)
>50	11 (5.5)	4 (1.9)	15 (3.7)
Health worker's qualifications			
Midwife	199 (100)	115 (54.8)	314 (76.8)
Nurse	0 (0.0)	95 (45.2)	95 (23.2)
Health worker's unit of work			
Hospital delivery ward	—	95 (45.2)	95 (23.2)
Hospital perinatal ward	—	101 (48.1)	101 (24.7)
Hospital (other ward)	—	14 (6.7)	14 (3.4)
Puskesmas	199 (100)	—	199 (48.7)
Health worker's training			
Received training in labor and delivery in the past 3 years	111 (56.6)	74 (35.2)	185 (45.6)
Received training in newborn care in the past 3 years	97 (49.7)	120 (57.1)	217 (53.6)

midwives performed better than midwives from *puskesmas*: 3.8 correct (confidence interval [CI], 3.43–4.19) vs 3.0 correct (CI, 2.77–3.26)—a statistically significant difference.

Table 4 presents responses for each of the essential newborn care knowledge questions, which were asked of midwives in *puskesmas* and of nurses in hospitals. These questions focused on knowledge of supplies needed for essential newborn care, care that a newborn should receive immediately after and within 1 hour of birth, and knowledge of the signs of newborn sepsis. The mean knowledge score was 0.79 (SD, 0.87) among all 288 respondents. There was no statistically significant difference in scores between hospital workers and *puskesmas* workers (0.80 correct [CI, 0.64–1.00] vs 0.78 correct [CI, 0.67–0.92]).

Table 5 displays the results from the Poisson regression, which demonstrates that there was a slight association between age and maternal health knowledge score among 40–49-year-old respondents when compared with respondents who were under 30 (adjusted incidence rate ratio [IRR] 1.09; 95% CI, 1.01–1.18). Receipt of in-service training in labor and childbirth care in the past 3 years and receipt of supervision in the past 3 months were not associated with maternal health knowledge score ($P>0.05$). There was a slight increase in the newborn health knowledge score based on whether the health worker had received in-service training in newborn care in the past 3 years (adjusted IRR 1.19; 95% CI, 1.02–1.40) after adjustment for other covariates. There was no association between newborn health knowledge score and health worker's qualification (adjusted IRR 0.98; 95% CI, 0.76–1.26), whether they received supervision in the past 3 months (adjusted IRR 1.14; 95% CI, 0.90–1.44), or age category.

4 | DISCUSSION

Findings from this study indicate that midwives and nurses working in both hospitals and *puskesmas* across Indonesia have deficiencies in knowledge of basic maternal and newborn care guidelines for handling normal childbirth as well as maternal and newborn emergencies, specifically AMTSL, management of severe pre-eclampsia, and obstructed labor. Midwives and nurses in this study correctly answered an average of only four out of 10 maternal health knowledge questions and only one out of three newborn questions. For knowledge of maternal health, the lowest performance was on questions related to antibiotics for sepsis (1.3% correct), actions to take for pre-term birth (6.3% overall), and signs and outcomes of obstructed labor (16.6% and 5.6%, respectively).

According to Indonesia's universal health coverage policy, if a pregnant woman chooses to deliver her baby in a health facility, she must first visit a *puskesmas*, unless she has a complication.[10] Our study found that maternal health knowledge scores were higher among hospital-based midwives than those in *puskesmas*; however, there was no difference in newborn care knowledge score between staff in *puskesmas* and in hospitals. One explanation for the slightly higher score for the maternal health questions among hospital health workers is that they could have more exposure to more complicated cases, which was also suggested in a study in Pakistan that looked at provider knowledge of routine management of pre-eclampsia.[17] In our study, among the 10 questions asked, there were no significant differences in knowledge for seven of the 10 questions between the midwives and nurses in hospitals and *puskesmas*. However, overall knowledge scores were low in both types of health facilities.

In the present study, whether the health worker had been trained or not trained in labor and childbirth care in the past 3 years was not associated with maternal health knowledge score but was associated with a higher newborn health knowledge score. There is some evidence to suggest that the quality of training may need to be strengthened. The Government of Indonesia instituted a village midwife program in 1989 (*Bidan di Desa*) to place an SBA in every village.[10] Nurses were

TABLE 3 Maternal health knowledge among midwives in *puskesmas* and hospitals.

	Puskesmas	Hospitals	Total	*P* value[c]
Midwives	n=196[a]	n=106	n=302	
Number who answered correctly	n (%)	n (%)	n (%)	
Routine care				
Routine delivery care	190 (96.9)	96 (90.6)	286 (94.7)	**<0.001**
Named all 3 AMTSL steps	87 (44.4)	44 (41.5)	131 (43.4)	0.726
Knowledge about when amniotic membranes should be broken	35 (17.9)	10 (9.4)	45 (14.9)	0.099
Pre-term birth				
Correct actions that should be taken for a woman who is 32 weeks gestational age with regular contractions, 3 cm dilated and with intact amniotic membranes	3 (1.5)	16 (15.1)	19 (6.3)	**<0.001**
Postpartum hemorrhage				
Appropriate actions to take if a woman has uterine atony	116 (59.2)	59 (55.7)	175 (57.9)	0.518
Pre-eclampsia				
Correct actions that should be taken for a woman at term with severe pre-eclampsia	111 (56.6)	58 (54.7)	169 (56.0)	0.756
Correct diagnosis of case scenario (severe pre-eclampsia)	0 (0)	97 (91.5)	97 (32.1)	**<0.001**[b]
Obstructed labor				
Signs of obstructed labor	34 (17.4)	16 (15.1)	50 (16.6)	0.672
Possible outcomes of obstructed labor	11 (5.6)	6 (5.7)	17 (5.6)	0.985
Sepsis				
Antibiotics for postpartum endometritis	3 (1.5)	1 (0.94)	4 (1.3)	0.698
Mean maternal health knowledge score (SD)	3.0 (SD 1.2)	3.8 (SD 1.2)	3.3 (SD 1.8)	**<0.001**

Abbreviation: SD, standard deviation.
[a]Excluded three *puskesmas* midwives who said that they did not provide delivery services.
[b]Omitted: cell value for *puskesmas* midwives was 0.
[c]The *P* values in bold are statistically significant.

also to be trained in midwifery through a 1-year program.[8] By 1994, the first of 60 000 trained *bidans* were deployed; however, the quality of training was compromised by the need to deploy *bidans* as quickly as possible.[18] One study in Indonesia highlighted the need for further development and training of midwives in a wide range of tasks[19] and another study pointed out that 60% of midwives and nurses have inadequate training and preparation for their roles.[18]

The findings related to poor knowledge of obstetric and immediate newborn care guidelines are not unique. Studies conducted in Benin, Nicaragua, Jamaica, and Rwanda also demonstrated that only about half of the SBAs (an average of 56%) were able to correctly answer all the knowledge questions related to guidelines for infection prevention, uncomplicated labor and birth, immediate newborn care, postpartum hemorrhage, pregnancy-induced hypertension, sepsis, and AMTSL.[20] In Pakistan, three cadres of health workers performed well below competency levels for maternal, newborn, and child health knowledge and skills.[21] In two districts in Karnataka, India, most SBAs could name the correct drugs for AMTSL, hypertension, and eclampsia, but had poor knowledge of appropriate drugs for maternal puerperal sepsis and newborn infections.[22]

TABLE 4 Newborn care knowledge among nurses and midwives who provide newborn care.

	Puskesmas	Hospitals	Total	*P* value
Nurses and midwives	n=195[a]	n=93	n=288	
Number who answered correctly	n (%)	n (%)	n (%)	
Standard instruments and supplies for essential newborn care	33 (16.9)	17 (18.3)	50 (17.4)	0.733
Care that a newborn should receive after delivery and within 1 hour of birth	67 (34.4)	22 (23.7)	89 (30.9)	0.106
Signs of newborn sepsis	53 (27.2)	35 (37.6)	88 (30.6)	0.073
Mean newborn health knowledge score (SD)	0.78 (SD 0.88)	0.80 (SD 0.84)	0.79 (SD 0.87)	0.907

Abbreviation: SD, standard deviation.
[a]Excludes four midwives who said they do not provide newborn care.

TABLE 5 Factors associated with maternal and newborn health knowledge.

Characteristics	Unadjusted IRR (95% CI)	*P* value[a]	Adjusted IRR (95% CI)	*P* value[a]
Maternal health knowledge				
Age, y (*ref=under age 30*)				
30–39	1.05 (0.92–1.20)	0.463	1.03 (0.92–1.16)	0.563
40–49	1.05 (0.95–1.15)	0.367	1.09 (1.01–1.18)	**0.024**
>50	1.03 (0.90–1.17)	0.699	1.06 (0.99–1.13)	0.110
Received labor and delivery care training in the past 3 years	0.98 (0.92–1.05)	0.655	0.99 (0.93–1.04)	0.674
Received supervision in the past 3 months	0.98 (0.91–1.05)	0.555	0.99 (0.93–1.05)	0.629
Facility type (*ref=puskesmas*)	1.26 (1.15–1.39)	**<0.001**	1.28 (1.17–1.40)	**<0.001**
Newborn health knowledge				
Age, y (*ref=under age 30*)	1.01 (0.99–1.03)	0.087	1.15 (0.69–1.91)	0.581
30–39	1.10 (0.68–1.79)	0.690	1.09 (0.77–1.54)	0.626
40–49	1.04 (0.75–1.44)	0.811	1.41 (0.81–2.44)	0.219
>50	1.35 (0.76–2.43)	0.308		
Health worker's qualification (*ref=midwife*)	1.01 (0.80–1.28)	0.907	.098 (0.76–1.26)	0.864
Received newborn training in the past 3 years	1.17 (1.02–1.35)	**0.028**	1.19 (1.02–1.40)	**0.037**
Received supervision in the past 3 months	1.15 (0.90–1.47)	0.253	1.14 (0.90–1.44)	0.284

Abbreviations: IRR, incidence rate ratio; CI, confidence interval.
[a]The *P* values in bold are statistically significant.

Findings from our study indicate that there is a need to improve knowledge of healthcare providers. Unexpectedly, in-service trainings and supervision were not associated with improved maternal knowledge scores; however, we do not know the quality of the training or supervision, nor their focus. Options to strengthen provider knowledge and skills include continuing professional development, competency-based curricula at the pre-service and in-service levels, problem-based learning approaches on guidelines and essential drug lists, implementation of licensing and credentialing processes, and better clinical mentorship.[23–25]

4.1 | Limitations

While the knowledge tests used in this study have been used in multiple countries under the MCHIP program, the tests were not validated in the Indonesian context. The knowledge questionnaire was fairly short, even though it was targeted, so it may be hard to make generalizations about respondents' general knowledge based on the small number of questions. Information was also collected from doctors and medical specialists but due to the low numbers, these data were excluded.

5 | SUMMARY AND CONCLUSION

Findings from this study indicate that midwives and nurses in both *puskesmas* and hospitals have significant gaps in knowledge of maternal and newborn healthcare practices. These knowledge deficits pose a threat to effective service coverage, which in turn may influence health outcomes for mothers and their newborns. Although knowledge does not always translate into practices, poor provider competencies have been associated with delays in receiving appropriate care.[25] To reduce Indonesia's high maternal mortality ratio, additional information should be collected to understand factors that may affect health workers' performance, including attitudes, satisfaction, confidence, and commitment.

AUTHOR CONTRIBUTIONS

RS, MT, AP, and LA contributed to conceptualization of the article. RS, MT, AP, and SA designed the methodology. RS and SA conducted formal analysis. An original draft of the article was written by RS and MT. All authors contributed to writing and review of the final manuscript.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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