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Abstract
This is a case-control study about the relationship between the qualities of midwifery care, other factors, and the incidence of maternal mortality in the hospitals. Information collected were midwives placement, midwives working environment, and material support in the hospitals. Unmatched midwives placement leads to maternal mortality by 3.86 times compared to the matched midwives placement. Unmatched quality of midwifery care causes maternal mortality by 6.74 times compared to the matched quality midwifery care. Unmatched midwives working leads to maternal mortality by 1.11 times compared to the matched working environment. Also, unmatched support materials causes maternal mortality by 1.55 times compared to the matched support material. There is a relationship between midwives placement and maternal mortality with $p< 0.05$. There is also a significant relationship of quality of midwifery care to maternal mortality with $p< 0.001$ in the government-owned hospitals.

Key words materials support, maternal mortality, midwives placement, working environment

Maternal Mortality in West Sumatra Province: An Analysis of the Impact of Quality of Midwifery Care in the Hospital

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Introduction

An estimated 529,000 women worldwide die from the complications of pregnancy and childbirth each year, but in developing countries, a woman is 46 times more at risk.[1] In West Sumatra Province, the maternal mortality rate (MMR) was 212 per 100,000 live births in 2011. The highest MMRs were in West Pasaman District, Padang Municipality, Padang Pariaman District, Darmasraya, and Sawahlunto/Sijunjung District.[6,7] Quality assessment and improvement activities are relevant to the public health sector and community-based organizations in healthcare,[3] and thus, related stakeholders should be concerned because an improvement in performance by a pertinent institution can result in higher quality services.

Globally, a continuum of maternal and child health care is essential for the survival and well-being of mothers and newborns.[4] One of the recognized ways to prevent maternal death is to provide medical workers, including midwives, in sufficient quantities. Ideally, one midwife can serve 1000 childbearing women.[2] Throughout Indonesia, 751 midwifery institutions produce about 50,000 midwives per year. However, the practice fields are limited for midwifery students, making it difficult for them to achieve competency and ultimately affecting the quality of care.

In addition to complications of pregnancy that cannot be handled by untrained or unskilled midwives, maternal

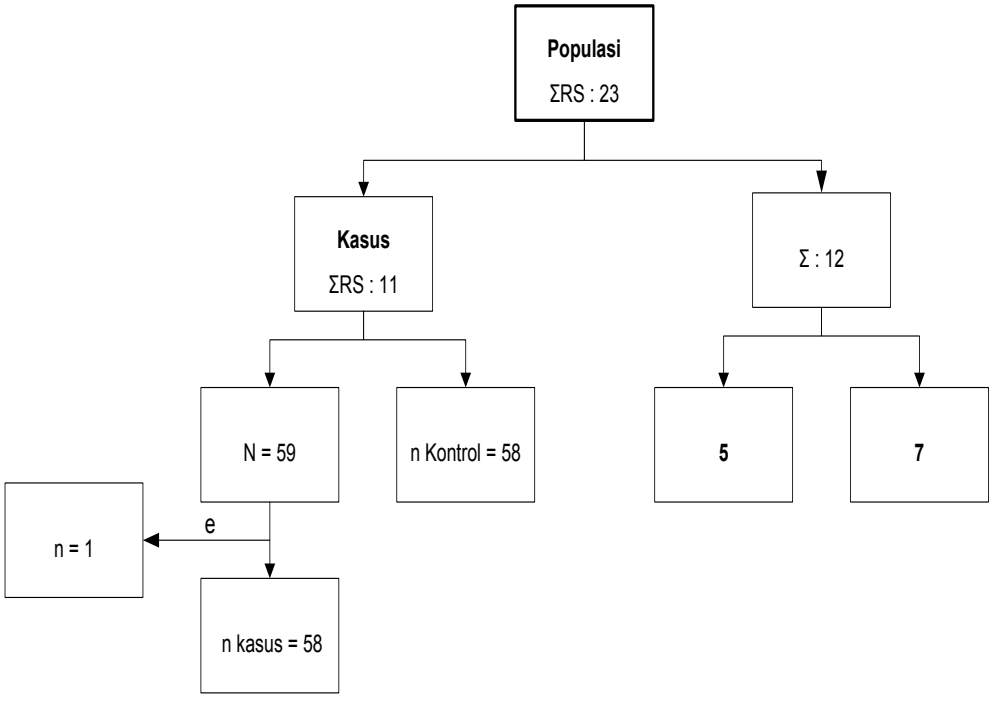
mortality also results from various other factors. Women may face delays in reaching health centres because of the influence of social and cultural factors on decision making by families, or the lack of communication devices or physical access to these health services that makes referral difficult.[5] Once they reach hospital, they also face delays getting help.

Other problems in hospital are administrative, in that the number of patients can sometimes exceed room capacity, and there is often a lack of material support or proper maintenance of equipment. Along with an unbalanced ratio in the number of health professionals and patients served, other problems include poor interpersonal relationships between health personnel and patients, and health workers sometimes lack motivation and have a poor work ethic. (8). In order to reduce the MMR, attention needs to be paid to the organizational factors of midwifery work, such as the placement of midwives and their practice environment. In general, there is a need to improve the quality of care by such efforts as improving the status of women, offering continuing education, developing midwife competency according to the standards of the International Confederation of Midwives (ICM) and, by improving the entire social context. Based on the above problems, the formulation of the research problem was: "Is there a relationship between the quality of midwifery care in hospitals and the number of maternal deaths in West Sumatra Province?" The objective of this study was to find ways to determine this relationship between the quality of midwifery care and other factors and the incidence of maternal deaths in the government-owned hospitals in the West Sumatra province in the Republic of Indonesia.

Research method

This study used an unmatching case control design[9-11] with both quantitative and qualitative approaches. The quantitative approach identified clusters of cases and controls while the qualitative approach explored the deeper information needed to support or reinforce the results of the quantitative analysis. The qualitative approach was implemented with interviews with obstetricians as a function of collaboration in hospital. The study was conducted between March 1, 2012 and February 1, 2013, and West Sumatra Province was chosen as a location because of its high MMR. Eleven government-owned hospitals with maternal death cases were involved: M. Djamil General Hospital, Achmad Mochtar Local Hospital in Bukittinggi, Hanafi Batu Sangkar Local Hospital, Solok Local Hospital, Adnan Wd Local Hospital in Payakumbuh, Lubuk Sikaping Local Hospital, Pariaman Local Hospital, Sungai Dareh Local Hospital, Sijunjung Local Hospital, Pasaman Barat Local Hospital, and Pesisir Selatan Local Hospital. The study was carried out in stages: data collection of the midwives' placement and hospital-based maternal mortality data, observation of the midwives' working environmentand the support material available, and assessment of the quality of midwifery care. Primary data was also collected directly through interviewing the respondents, by using a questionnaire based on the registers

Figure 1: Chartflow of research sample collection



or hospital reports. The questionnaires were taken by the Safe Motherhood Assessment Tool.[12]

Preliminary stages of the study included obtaining ethics approval, and assigning interviewers and training them to conduct interviews as well as with some obstetricians and gynecologists at the hospitals. Initally, the study population was all women giving birth at the 23 hospitals in West Sumatra Province, but the number was decreased to the 11 in which women had died in childbirth. The subjects were divided into two 2 groups: the case group consisting of mothers who died during pregnancy, in childbirth, or during the postpartum period, and the control group consisting of mothers who lived through their experience in these 11 hospitals.

This study used three kinds of variables: a) the dependent variable, which was the maternal deaths acquired in the Emergency Room, maternity room, Intensive Care Unit, maternity care unit, and operating theater in the 11 government-owned hospitals; b) the independent variable, which consisted of the individual level of placement of midwives (midwife ratios, qualifications, and positions) and the institutional hospital level, which consisted of the organization and material support of the midwives' working environment; and c) the intervening variable, which was the process of midwifery care that included self-service, collaboration, referral, and continuing care.

The sample size used the 2008 PASS program with a comparison of case and control group of 1:1; thus, the number of respondents was 58 cases and 58 controls. The total number of samples in the study, therefore, amounted to 116 respondents.

Data analysis in this study includes univariable, bivariate, and qualitative analysis. In order to test the hypothesis, this study uses the x^2 (Chi-Square) statistical test with a significance level (p value <0.05) or 95% confidence interval.

Results

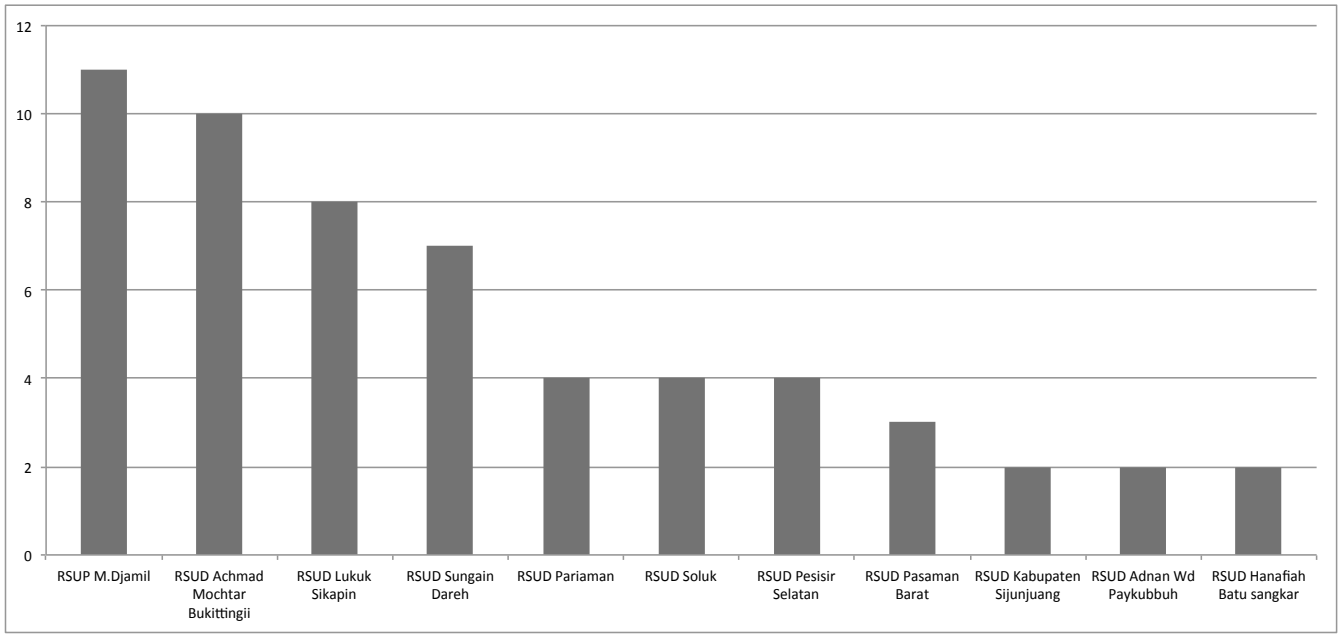
1. Descriptive data

Table 1 shows that 27 women (46.5%) obtained secondary education in the case group while 17 women (29.3%) did so in the control group. Twenty-nine (50%) of women in the case group were referral patients while 29 (50%) of women in the control group came alone (were not referred).

Table 1: Characteristics of case and control groups in government-owned hospitals in West Sumatra Province

Variable	Maternal deaths				p
	Dead		Live		
	n	%	n	%	
Gestational age					0.004
Trimester 2	8	13.8	0	0	
Trimester 3	48	82.8	58	100	
Postpartum	2	3.4	0	0	
Age					0.385
<20 years	1	1.7	1	1.7	
20-35 years	34	58.6	41	70.7	
>35 years	23	39.7	16	27.6	
Education					0.166
Primary	1	1.7	2	3.5	
Secondary	27	46.5	17	29.3	
High school	29	50.0	39	67.2	
Higher education	1	1.7	0	0	
Origin of patients					0.000
Referral	29	50.0	0		
Self-admission	29	50.0	58	0100	

Figure 2: Data on deaths found in 11 hospitals in West Sumatra Province



2. Outcome of data

The highest number of deaths (n=11) occurred in the Dr. M. Djamil hospital in Padang. This facility is the referral centre for the central region and is the leading public hospital for the Sumatra area.

Figure 3 demonstrates that the leading causes of death are hypertension, pre-eclampsia and eclampsia (44.8%), followed by hemorrhage (31%). According to Indonesian health profiles (2007), the leading cause of maternal deaths in that country is hemorrhage (28%) followed by eclampsia (24%). Anemia and chronic energy deficiency (CED) in pregnancy are the major causes of bleeding and infection and factor heavily in maternal mortality. In many countries, at least a quarter of all maternal deaths are due to hemorrhage; the proportion ranges from less than 10% to nearly 60%.

3. Bivariable Analysis

Table 2 shows that 69% of the midwives' placement mismatch occurred in the case group compared to 43% in the control group. Analysis results obtained an OR value of 2.93 (95%

Figure 2: Data on deaths found in 11 hospitals in West Sumatra Province

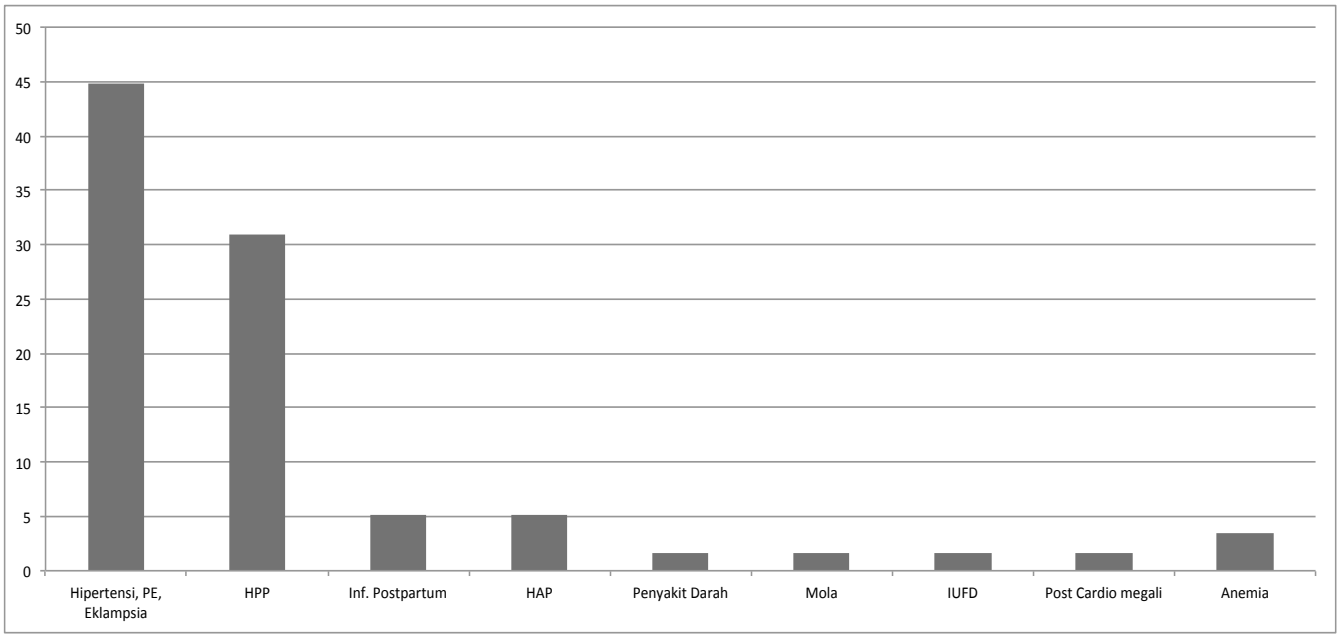


Table 2: Characteristics of case and control groups in government-owned hospitals in West Sumatra Province

Variable	Maternal deaths				p	95% CI
	Case		Control			
	n	%	n	%		
Midwives' placement						
Ratio						
Unmatched	33	56.9	17	29.3	3.18	1.38-7.39
Matched	25	43.1	41	70.7		
Qualification						
Unmatched	19	32.8	0	0.0	-	7.17-
Matched	39	67.2	58	100.0		
Position						
Unmatched	28	48.3	19	32.8	1.91	0.84-4.36
Matched	30	51.7	39	67.2		
Placement index						
Unmatched	40	69.0	25	43.0	2.93	1.28-6.75
Matched	18	31.0	33	57.0		
Quality of midwifery care						
Independent care						
Unmatched	42	72.4	22	37.9	4.29	1.83-10.16
Matched	16	27.6	36	62.1		
Collaboration						
Unmatched	33	56.9	19	32.8	2.70	1.19-6.19
Matched	25	43.1	39	67.2		
Referral care						
Unmatched	38	65.5	16	27.6	4.98	2.11-11.90
Matched	20	34.5	42	72.4		
Continuing care						
Unmatched	40	69.0	20	34.5	4.22	1.81-9.90
Matched	18	31.0	38	65.5		
Index of quality of midwifery care						
Unmatched	44	75.9	22	37.9	5.14	2.15-12.47
Matched	14	24.1	36	62.1		
Midwives working environment						
Unmatched	27	46.5	26	44.8	1.071	0.48-2.37
Matched	31	53.5	32	55.2		
Material Support						
Unmatched	21	36.2	20	34.5	1.078	0.46-2.47
Matched	37	63.8	38	65.5		

Table 3: Analysis of the relationship of midwives' placement, midwives' working environment, and material support to quality of midwifery care in government-owned hospitals in West Suma-

Variable	Quality of midwifery care				p
	NC		C		
	n	%	n	%	
Midwives placement					
Ratio					
Unmatched	29	58	21	42	0.835
Matched	37	56.1	29	43.9	
Qualification					
Unmatched	8	42.1	11	57.9	0.155
Matched	58	59.8	39	40.2	
Posisi bidan					
Unmatched	30	63.8	17	36.2	0.213
Matched	36	52.2	33	47.8	
Index of midwives placement					
Unmatched	43	66.2	22	33.8	0.023
Matched	23	45.1	28	54.9	
Midwives working environment					
Unmatched	39	73.6	14	26.4	0.001
Matched	27	42.9	36	57.1	
Material support					
Unmatched	32	78.1	9	21.9	0.001
Matched	34	45.3	41	54.7	

CI: 1.28 to 6.75). The unmatched midwives placement in the case group was 2.9 times more than in the control group. The mismatch in quality of midwifery care between the case and the control groups was 75.9% and 37.9%, respectively. Analysis results obtained an OR value of 5.14 (95% CI: 2.15 to 12.47). The unmatched quality of midwifery care in the case group was 5.1 times more than that in the control group.

The mismatch in the midwives' working environment in the case group was 46.5% compared to 44.8% in the control group. Analysis results obtained an OR value of 1.07 (95% CI: 0.48 to 2.37). The unmatched working environment in the case group was 1.07 times more than in the control group. The mismatch of material support between the case group and the control group was 36.2% and 34.5%, respectively. Analysis results obtained an OR value of 1.07 (95% CI: 0.46 to 2.47). The unmatched material support in the case group was 1.07 times more than that in the control group.

Table 3. Analysis of the relationship of midwives' placement, midwives' working environment, and material support to quality of midwifery care in government-owned hospitals in West Sumatra Province

In Table 3, the mismatch of midwives' placement and quality of care obtained in the case and the control groups was 66.2% and 33.8%, respectively. The analysis showed a significant association between midwives' placement and quality of care (p = 0.023). The mismatch of working environment to quality of midwifery care in the case group was 73.6% compared to 26.4% in the control group. The analysis showed there was a significant correlation between working environment and quality of midwifery care (p=0.001). The mismatch of material support to quality of care in the case group was 78.1% and in the control group was 21.9%. The analysis showed there was a significant correlation between material support and quality of care (p= 0.001).

After considering hospital level, the unmatched midwives' placement would cause a maternal mortality 3.86 times greater when compared with the matched placement. The unmatched quality of midwifery services would cause a

Table 3: Analysis of the relationship of midwives' placement, midwives' working environment, and material support to quality of midwifery care in government-owned hospitals in West Suma-

Variable	Level 1	Level 2	Level 3	Level 4
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Midwives placement				
Unmatched	3.86 (1.60-9.31)			
Matched	1			
Midwife quality				
Unmatched		6.74 (2.73-16.61)		
Matched		1		
Working environment				
Unmatched			1.11 (0.44-2.81)	
Matched			1	
Material support				
Unmatched				1.15 (0.40-3.31)
Matched				1

maternal mortality 6.74 times greater when compared with the matched quality of midwifery services. The unmatched midwives' working environment would lead to a greater maternal mortality by 1.11 times compared with the matched midwives' working environment. Additionally, the matched material support would cause a greater maternal mortality by 1.15 times compared with the matched material support.

Discussion

1. Quality of midwifery care, which is better in hospitals with the matched midwives' placement compared with the unmatched midwives' placement

The dimension of midwives' placement consisted of midwife ratio, qualifications, and position. Table 2 shows the mismatch of 69 percent of midwives placement in the case group compared with 43% in the control group. The analysis results obtained an OR value of 2.93 (95% CI: 1.28 to 6.75). It was found that the mismatch midwives' placement was 2.9 times in the case group more than that in the control group.

In Table 3 concerning the analysis on the relationship of midwives' placement to quality of midwifery care, the mismatch in the case group and the control group was 66.2 percent and 33.8%, respectively. The analysis showed a significant association between the midwives' placement and quality of care (p = 0.023). Table 4 shows that, after considering the level of hospital, there was the unmatched midwives' placement that caused maternal mortality of 3.86 times compared with the matched midwives' placement.

WHO and several other health organizations have identified midwives as key to reducing maternal and infant mortality and disability globally.[14] They play an important role in the lives of mothers and their babies,[13] boosting self-confidence in women and strengthening their commitment to parenthood. Results from the research and the interviews undertaken in this study found that the level of competence of Indonesian midwives has not yet reached international standards due to inadequate training and the number of midwifery institutions without proper practice fields for their students. Therefore, midwifery institutions must continue to develop curriculum and learning strategies in order to reach the expected competencies. Improved education and training of lecturers are needed to address these challenges.

A high quality of care depends on competent midwifery services and thus proper planning should be taken to meet these needs.Midwives, as professionals, are obliged to provide services to the public and must have core competencies to be able to carry out their function in providing quality midwifery services.[19] The assessment of quality services can be done by using ServQual dimensions, namely Responsiveness, Assurance, Tangible, Empathy, and

Reliability (RATER). Using RATER, healthcare providers can explore perceptions of patients/ care users about the quality of health services that they have received. Thus, a shared understanding related to the quality of services expected can be obtained between providers and users.[20] The quality of the interaction between the patient and the service provider, in this case the midwife, depends on several elements: quality of communication, ability of midwives to maintain patient confidence, and ability of midwives to provide services to patients with care, empathy, honesty, and sensitivity.[21] A high quality service, which is expected to maximize the well-being of patients, can thus be determined logically.[22] Its intended objective is a state of health, and a quality service is only obtained if a midwife can help her patients achieve appropriate levels of health to enjoy a healthier life.[22]

As healthcare providers, midwives have an important and strategic position in helping to reduce maternal and infant morbidity and mortality and in preparing the next generation. A sufficient number of midwives who have acquired competency through a standardized education is necessary to meet service needs throughout all healthcare facilities.

Midwives must meet standards of professional practice and abide by a code of ethics, but they also must be supported by adequate facilities and infrastructure. Adequate midwifery services will spearhead a reduction in the MMR,[15,16] According to the Minister of Health of the Republic of Indonesia,[17] healthcare excellence depends on a high quality of care, leading to satisfaction at both the level of the patient as well as the general population. Health care providers should be supported by sound knowledge and technical competence in order for them to engage willingly in productive work and harmonious working relationships. The application of professional standards of care that include a comfortable work environment and an adequate living wage will help to produce competent and motivated workers.[18]

2. Quality of midwifery care which is better in the matched midwives working environment compared with the unmatched midwives working environment

In Table 2 regarding the results of analysis on midwives working environment, the mismatch in the case and control groups was 46.5 percent compared to 44.8 percent, respectively. The analysis results obtained the OR value of 1.07 (95% CI: 0.48 to 2.37). It was found that unmatched working environment was 1.07 times more than matched working environment.

In Table 3 that shows the analysis on the relationship between midwives working environment and quality of care, the mismatch of midwives working environment in the case group was 73.6% and in the control group was 26.4%. The analysis showed that there was a significant association between midwive working environment and quality of midwifery care ($p = 0.001$). Additionally, table 4 shows that, after considering the level of hospital, unmatched midwives working environment would lead to maternal mortality by 1.11 times compared with matched midwives working environment.

From the observations and interviews conducted for this study, there was little leadership for midwives, as suggested by irregular meetings. The process of recording and reporting was not timely and the feedback from the maternal audit was not maximized.

Research conducted by Franco-Santos, Kennerley, et al.[23] demonstrate that organizational culture and working conditions are determinants that affect employee motivation in public hospitals in Jordan. Sorrentino and Vielhauer[24], in their study conducted in a metropolitan hospital in Chicago, state that in situations where the head nurse assigns tasks to his or her subordinates in ambiguous language, subordinates were confused about what form the task took, the clarity of the task, and ultimately lost respect for their work. Effective leadership and supervision is important to ensure quality care to patients. The Path-Goal leadership model encourages leaders to motivate subordinates for effective performance in the workplace enviroment by implementing support training and providing awards.[24]

Individual characteristics have a positive and significant impact on work motivation. The results of this study found that midwives who were interested in midwifery from an early age, and who were interested in it not merely as a source of income but had a passion for helping others and for carrying out their duties in a professional manner, were more highly motivated. Research by Kuvaas and Dysvik[25] demonstrates that the basic elements of a good working atmosphere, congenial work relationships, a safe physical environment, and job security along with recognition for achievement and increased responsibilities motivated workers to perform better.

Suswati[26] suggests characteristics of an organization, including its policies, culture, and environment also affect the motivation of midwives. Wang and Noe[27] contend that rewards for employees for their achievements and constructive feedback on their work can also increase work motivation. Motivation increases when nurses are empowered, when they are able to undertake self-development autonomously and

have the opportunity to be innovative; these factors improve their competence and encourage them to perform their tasks professionally according to their skills.[28] Decisions are made by considering input from employees; in this case, information-sharing mechanisms can be delivered quickly by improving coordination between nurses and physicians. Interpersonal communication must be effective; if there are conflicts, they need to be resolved constructively.

The main motivating factor for health workers is appreciation by their leaders, colleagues, and others in their working environment. Low salaries and difficult working conditions, however, work to disadvantage this environment. Activities associated with rewarding still get less attention; thus, performance is not optimal. Therefore, ways to encourage employees that are not financial in nature should be taken into consideration for the development of human resources.[29] Supervisory systems and working conditions also require attention so that skilled workers can achieve their full potential. A research study in Vietnam shows that tightly controlled supervision does not help services. Findings from Zimbabwe, Benin, Vietnam, and Armenia all emphasized the importance of achievement and community recognition for health professionals.

3. Quality of midwifery care which is better with the matched material support compared with the unmatched material support

Table 2 shows the mismatch in material support that the mismatch in the case group was 36.2% compared with 34.5% of that in the control group. The analysis results obtained an OR value of 1.07 (95 % CI: 0.46 to 2.47). It was found that unmatched material support was 1.07 times more than the matched material support.

Table 3 shows the analysis of material support to quality of care. It obtained a mismatch value in the case group of 78.1% and in the control group of 21.9%. The analysis showed there was a significant correlation between material support and quality of midwifery care (p = 0.001). In Table 4, after considering the level of hospital, it obtained that the unmatched material support would cause maternal mortality by 1.15 times compared with the matched support material.

Material support in each hospital varied according to the type of hospital and the availability of funds. In general, hospitals had tools in accordance with SOP but they were not sufficient. In addition, the limited number of ambulances at hospitals and health centers often resulted in referral cases being overlooked. Blood supply problems were often caused by inadequate blood storage facilities.

Some hospitals had problems with infrastructure, leading to lower quality of service, less motivated health professionals, and infectious diseases in the community, all of which caused a lack of societal acceptance. Poor and rural communities often suffer the most because because health centres and hospitals often do not exist there.[30,31] Problems with infrastructure include (a) no buildings available or poor quality design and construction of those that do exist, (b) inadequate maintenance, and (c) lack of utilities such as water, electricity, fuel, or telephone.

It has been estimated that almost 40% of the medical equipment in developing countries is not in accordance with the needs of the services required.[32] Finding even the most basic items remains a problem. The availability of equipment has a very important function in providing care. International agencies from developed countries who donate equipment to developing countries have caused some difficulties since the operation and maintenance of some of the donated equipment is too sophisticated.[33] Using vacuum extractors in midwifery, for example, requires special care.[34] Medical supplies such as drugs, equipment, and other consumables are an important part of all curative and preventive services. Essential medicines and medical supplies that form the approved treatment protocol for maternity care should be available at ll service points. Such supplies as magnesium sulfate (Langer et al) and special gloves for the treatment of high risk obstetriccal patients who have HIV and for those needing blood transfusions are essential.[35]

Similar to the need for better infrastructure and equipment, the functioning of the health system needs to be improved. Transport and communication must be available in all maternity care service facilities, from those in villages to a tertiary referral center in larger towns. Transport and communication are vital elements of the referral system; they are needed to support maternity care because of the complications that can occur in pregnant women and newborns (36). Three issues in developing countries that hamper referral systems are (a) delays in treatment decisions; (b) delays in reaching health facilities due to their distribution and location; and (c) delays in handling obstetric and neonatal cases due to limited transport, funding, and communication systems necessary to reach the facility. In most rural areas, health personnel are not available to the entire village, transport and communication are limited, and road conditions may hinder access.[37]

Personal or cultural barriers to access in poor communities increase the failure of women to reach a facility in a timely manner. However, pregnant women are routinely provided

education about childbirth and the early detection of the complications of pregnancy that commonly occur in the third trimester. Preparedness for complications is intended to increase the the knowledge of danger signs and help the woman plan for who they want to provide delivery assistance, who will accompany them in childbirth, how they will reach the facility, and, and how they will pay for it.[38] This intervention is done to address the delay in decision making.

Delays in the decision to seek treatment that occur at the household level concern the distance to reach care, its cost, and perceptions regarding the quality of available services. Institutional delays in the various aspects of care can be caused by lack of skill in dealing with obstetric emergencies, attitudes towards patients (soft skills), and lack of equipment and unavailability of medicines and blood supplies. Inadequate management structure at the tertiary level referral system can also cause bottlenecks in achieving appropriate level of care.[39-41]

The definition of adequate or inadequate geographical or physical access relates to the time required to transport women to the facility and takes into account the distance, road quality, climate, and type of transportation. Another definition determines that 5 km is the critical distance for the use of obstetrical services.[42-44] Estimated average time from the onset of postpartum hemorrhage, the leading cause of maternal mortality, to death is two hours, implying that it is not safe for women to be more than two hours away from emergency obstetric care.[45] For monitoring emergency obstetric care, no more than approximately two to three hours of travel time to the facility should be considered if life-saving treatment is to be implemented.[46] Also, according to research conducted in Kwale District, Kenya, antenal service utilization decreases the farther away health services are; woman who live more than five kilometres from the service and treatment facility tend not to access antenatal care.[48] In Haiti, having a health center within 5 kilometers significantly improves acceptance of antenatal care.[49]

Travel time depends on whether it is the day or evening; this requires an organized transport system.[47] Ambulances and taxis are the most effective method to transport women who have been referred for treatment, but the problem is having an ambulance available at government-owned hospitals with many patients needing emergency care that is not due to pregnancy alone. Studies such as those in Sri Lanka suggest that the government provide each regional hospital with three to five ambulances in order to reduce delays in transport for pregnant women.[50]

Ambulance systems are expensive, limited to urban areas, and not practical everywhere. A motorcyle ambulance, however, is an effective and cheap option to transport patients in developing countries, especially in rural areas with little or no access to public transport. Using motorcycle ambulances is cost-saving compared to a car ambulance. One study that looked at how a village ambulance service was procured based on a village fund program demonstrated the effectiveness of motorcycles in transporting patients. In general, this kind of transportation is easily accepted by many people and is helping pregnant women in particular access services.[51-55] It is expected that the motorcycle ambulance service will be improved and health centers or government officials can guide managers of transportation services in the use of three-wheeled motorcycles, which would be particularly useful for maternity patients..

Local hospitals in this study received referrals from primary health facilities, such as health centers or other hospitals. The primary centres complained that phone calls were not answered or that patients who deserved attention were abandoned. The current ambulance facilities meant that perinatology cases could not be taken, both because of insufficient numbers and the lack of a special ambulance that could look after these cases. Although a health information system is available in hospitals, it was not optimal. Local governments should encourage villages and districts to utilize local resources to strengthen health care access. Existing community participation needs to be managed and organized better. Heads of health centers should provide more taxis for referral services primarily to areas in which transportation is difficult. More attention needs to be paid to training workers on how to maintain the security and safety of the patient during transport.

Community participation is part of the process of community empowerment; however, implementation is still not optimal and this is a challenge to the sustainability of health programs. Access to health care remains a problem for some people. Access can be defined as the dimensions that describe the potential and actual capabilities of a particular population group to reach health services. Improved access, better service utilization, and a higher quality of service are policy priorities.

Individuals who live far away from health facilities have the most difficulty with access, and research on this factor has claimed much attention. Some studies have been related to staffing in remote areas, the use of mobile nurses[56,57] and improving the availability of ambulances at health facilities. The program “desa siaga” or “alert village” is one program

utilizing a four-wheeled vehicle belonging to local citizens as a "village ambulance".[58] Community-based interventions aim at preventing maternal and child illness and infant mortality. Research has concluded that community-level intervention for perinatal care can reduce maternal mortality, thus, training for traditional birth attendants can improve health behaviours and pregnancy outcomes.[59]

Conclusions and recommendations

This study demonstrated a significant correlation between quality of care and both midwives' placement ($p = 0.023$) and midwives' working environment ($p = 0.001$). There was also a relationship of material support to quality of midwifery care ($p = 0.001$). Quality of midwifery care affected maternal mortality.

Based on these conclusions, recommendations can be made as follows: The competence of midwives need to be improved by: a) increasing the quality of midwifery graduates in cooperation with the Indonesian Midwives Association (IBI) and of the practice fields as a place to improve midwifery skills, b) holding training and basic or comprehensive emergency obstetric care (PONED/PONEK) or EMoC in accordance with recognized standards, c) providing rewards and health insurance for midwives. Other steps that should be taken into account include: bringing the organization of the environment under the supervision or control of the leadership to improve the quality of service; increasing respect for staff; clearly indicating the expectations for autonomy and the division of tasks between each profession, as well as for monitoring and evaluating through the PONEK program; and making available material support through standardized tools, maintaining equipment, instituting appropriate ratios for patient visits by physicians and other medical personnel, utilizing the correct capacity of rooms according to the number of patients, properly running health information systems, transportation, and communication links, and utilizing water, electricity, toilets, etc. as needed. Quality of service should be improved through (a) increasing ANC, facilitating pregnant women with the MCH book, integrating ANC services at health centers and implementing ANC classes for pregnant women; (b) implementing such programs as MCH, Maternal and Perinatal Audit; (c) strengthening the capacity of the midwives' coordinator to supervise the implementation of the facility; (d) increasing efforts for births assisted by skilled health professionals through a partnership program between midwives and traditional birth attendants, the development of homes for expectant mothers awaiting delivery, and the implementation of successful delivery assurance programs; and (e) implementing a good referral system with community participation that will empower members and increase interest in the health of mother and child. Lastly, increase efforts at interprofessional collaboration to provide services to improve the quality of health services.

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