

# THE EFFECT OF REFERRAL AND TREATMENT OF SEVERE PREECLAMPSIA ON MATERNAL DEATH AT SULTAN IMANUDIN GENERAL HOSPITAL PANGKALAN BUN, CENTRAL KALIMANTAN

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## ABSTRACT

**Background:** Severe preeclampsia is an obstetric emergency, requiring a rapid appropriate referral and treatment. Emergency obstetrics are still facing three phenomena belated recognizing and deciding. Preeclampsia is also often belated reaching a reference place, and belated getting and adequate treatment. This study aimed to determine the effect of referral and treatment of severe preeclampsia on maternal death at Sultan Imanudin General Hospital Pangkalan Bun, Central Kalimantan.

**Subjects and Method:** This was retrospective cohort study conducted at Sultan Imanudin Hospital, Pangkalan Bun, Central Kalimantan, from January to December 2017. A sample of 94 pregnant women with preeclampsia was selected for this study by purposive sampling. The dependent variable was maternal death. The independent variables were referring, early treatment, referral travel time, operating room response time, delivery room, delivery time, and delivery, emergency response time, MgSO<sub>4</sub>, and Nifedipine. The data was obtained from medical records and analyzed by multiple logistic regression.

**Results:** The risk of maternal death increased with complicated delivery (OR=27.66; 95%CI = 3.71 to 206.26; p= 0.001), incompetent referral (OR= 21.80; 95%CI= 2.70 to 175.60; p= 0.004), and late treatment (OR=13.62; 95%CI= 2.25 to 82.45; p= 0.004), long referral travel time (OR= 9.99; 95% CI= 1.76 to 56.75; p= 0.009), long operating room response time (OR=0.05; 95%CI <0.01 to 0.56; p= 0.014), and long delivery room response time (OR=9.80; 95% CI=1.56 to 61.51; p= 0.015).

**Conclusion:** The risk of maternal death increases with complicated delivery, incompetent referral, late treatment, long referral travel time, long operating room response time, and long delivery room response time.

**Keywords:** maternal death, severe preeclampsia, complicated delivery, late treatment.

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## BACKGROUND

Based on the Indonesian Demographic and Health Survey (SDKI) in 2012, the Maternal Mortality Rate (MMR) in Indonesia reached 359/100,000 live births. The result of the MMR Inter-Census Population Survey showed a decrease by 305/100.00 live births (Ministry of Health, 2016).

However, this rate was still far from the Millennium Development Goals (MDGs) achievement target of 102/100,000 live births (National Development Planning Agency, 2010; Ministry of Health, 2015). According to WHO in 2014, the MMR in Indonesia

reached 214/100,000 live births. It has not yet reached the 2015 Healthy Indonesia target for the target of reducing MMR by 118/100,000 live births (WHO, 2015). In 2016-2030, the national health system through Sustainable Development Goals (SDGs) is targeting a reduction in MMR to below 70/100,000 live births (SDGs, 2016). The high MMR in Indonesia showed the low quality of maternal health services during pregnancy, childbirth and the puerperium. Efforts to reduce MMR must be followed by an increase in the degree of women and an increase in accessibility to health facilities

(SDGs, 2016).

The three main causes of maternal death were bleeding (30%), preeclampsia (25%), and infection (12%) (Ministry of Health, 2015). The incidence of preeclampsia in Indonesia was 128.273/year or around 5.3% (Statistics, 2015). Severe preeclampsia is a serious medical problem and has a high level of complexity. Severe preeclampsia not only affects the mother during pregnancy and delivery, but also causes postpartum problems due to endothelial dysfunction in various organs, such as the risk of cardiovascular disease and other complications (ISN, 2014).

The treatment of severe preeclampsia and its quality in Indonesia still varies between practitioners and hospitals. In 2016, the Indonesian Gynecological Obstetrics Association through the Feto Maternal Medicine Association has revised the National Medical Service Guidelines on the Diagnosis and Management of Preeclampsia. This guide is expected to be applied in primary health care services and hospitals. It is also expected to provide recommendations for policy makers to develop Clinical Practice Guidelines.

According to McCarthy and Maine in A Framework for Analyzing the Determinants of Maternal Mortality study, the risk factors for maternal death were divided into: (1) contextual determinants, include: economic, social and cultural factors regarding the status of women, family and society, (2) intermediate determinants, include: maternal health status, reproductive status, access to health services, health service behavior, unknown or unexpected factors, (3) proximate determinants include: pregnancy and obstetric complications (complications that occur during pregnancy, delivery and the puerperium) (McCarty and Maine, 1992).

Unicef found that primary health care could only reduce mortality by around 20%. An effective referral system could reduce mortality by around 80%. WHO stated that

one of the fundamental aspects of primary health care was the close relationship with the levels above. This close relationship is reflected as an effective referral system. The decrease of mortality rate is impossible without an effective referral system, especially for cases with complications and emergencies (BPS, 2012; Rochjati, 2004).

Maternal death and illness are often caused by obstetric emergencies obtained from the referral process which are not immediately handled. Emergency cases that are not immediately handled quickly and appropriately will lead to maternal death. Emergency obstetrics are still facing three phenomena belated recognizing and deciding to refer. It is often belated reaching a reference place and belated getting quick, appropriate, and adequate treatment (Rochjati, 2004).

The referral system for maternal emergency services refers to the main principle of the speed and accuracy of efficient and effective intervention that is in line with the capabilities and authority of service facilities. Every case with obstetric emergencies is managed according to the procedure, such as stabilization of the patient's condition, coordination of referral transportation and assisted by health workers during the referral process (Ministry of Health, 2013).

Severe preeclampsia is an obstetric emergency, requiring a rapid appropriate referral and treatment. The emergency of severe preeclampsia is still facing three phenomena belated. It is at risk of increasing maternal mortality.

The researchers wanted to find out the effect of referral and treatment of severe preeclampsia on maternal death at Sultan Imanudin General Hospital Pangkalan Bun. This study aimed to analyze the referral (referrer, early treatment, referral travel time) among patients with severe preeclampsia, to analyze the treatment (response time, Mg-

SO<sub>4</sub>, Nifedipine, delivery) of patients with severe preeclampsia, to find out the outcome of maternal death due to severe preeclampsia, and to analyze the effect of referral and treatment of patients with severe preeclampsia on maternal mortality.

## SUBJECTS AND METHOD

### 1. Study Design

This study was a case control analysis with secondary data from the medical records of patients with severe preeclampsia. The study was conducted at Sultan Imanudin Hospital, Pangkalan Bun, from January 2016 to December 2017.

### 2. Population and Sample

This study used purposive sampling, with a total sample of 94 patients.

### 3. Study Variables

The dependent variable was maternal death. The independent variables were referring, early treatment, referral travel time, operating room response time, delivery room, delivery time, and delivery, emergency response time, MgSO<sub>4</sub>, and Nifedipine.

### 4. Data Analysis

The effect of referral cases and treatment of severe preeclampsia patients with maternal deaths with severe preeclampsia was observed by calculating multiple logistic regression. Simple logistic regression was run to select candidate independent variable for inclusion for the multivariate regression model if a

single independent variable had  $p < 0.25$ . OR (Odds Ratio) was used as the measure of association.

## RESULTS

The characteristic of the patient as the respondents of the study is described in Table 1. Table 1. The characteristic of the respondent

The Characteristic of the Sample	Frequency	Percent
Age		
<20 years	7	7.4
20-35 years	63	67
>35 years	24	25.5
Education		
Primary School	18	19.1
Junior High School	34	36.2
Senior High School	38	40.4
Scholar	4	4.3
Occupation		
Housewife	86	91.5
Civil servant	1	1.1
Private	7	7.4
Gravida		
Primigravida	28	29.8
Multigravida	52	55.3
Grandemulti-gravida	14	14.9
Total	94	100

Tabel 2. The effect of referral and treatment in patient with preeclampsia

Independent variables	Percentage of Maternal death (%)	Odds Ratio	95% CI		P
			Lower limit	Upper limit	
<b>Delivery</b>					
Pervaginam	42.4	27.66	3.71	206.26	0.001
<b>Referrer</b>					
Doctor	17.4	21.80	2.71	175.61	0.004
Midwife	44				
<b>Early treatment</b>					
Yes	16.4	13.6	2.23	82.45	0.004
No	39.4				

<b>Travel time</b>					
30 minutes	16.4	1.00	1.76	56.75	0.009
> 30 minutes	39.4				
<b>Operating room response time</b>					
£ 30 minutes	29.8	0.06	<0.01	0.56	0.014
> 30 minutes	19.1				
<b>Delivery room response time</b>					
£ 30 minutes	15.6	9.80	1.56	61.52	0.015
> 30 minutes	32.7				
<b>Nifedipine</b>					
Yes		18	7.83	1.00	62.65
No	31.8				0.052
<b>MgSO<sub>4</sub></b>					
Yes	24.4	0.71	0.15	3.30	0.664
No	24.5				
<b>Emergency response time</b>					
5 minutes	23.1	0.79	0.14	4.47	0.794
>5 minutes	31.5				

## DISCUSSION

### 1. The Effect of Referral System on Maternal Death

There were 69 pregnant women with severe preeclampsia with a doctor as a referrer: 57 pregnant women with severe preeclampsia who lived and 12 pregnant women with preeclampsia who died. Doctor as a referrer had an effect on maternal mortality. The low level of knowledge and competence of midwives was the causes of the lack of screening for early detection of patients with severe preeclampsia, so that emergency treatment was not carried out. As a result, it would increase the risk of maternal death for mother with severe preeclampsia.

The risk approach system is a policy that can secure the process of pregnancy, delivery, and the puerperium, in reducing the risk of maternal death. Midwife knowledge regarding risk factors is still limited and the quality of antenatal care is still low. Therefore, it requires an approach in which all pregnant women are considered because they have risk to experience complication. In addition, the dedication of a midwife to al-

ways be cautious is needed in order to ensure the detection of high-risk pregnant women as early as possible (Rochjati, 2011).

### 2. The Effect of Early Treatment on Maternal Death

Based on the early treatment of the 61 pregnant women with severe preeclampsia, there were 51 pregnant women with severe preeclampsia who lived and 10 pregnant women with severe preeclampsia who died. Early treatment in patients with severe preeclampsia had an effect on maternal mortality.

Good, quick, and appropriate early treatment according to the competence of midwives and doctors in the first-level health facilities could immediately overcome the emergency in mothers with severe preeclampsia. Therefore, the risk of complications due to severe preeclampsia can be prevented as early as possible. In addition, the risk of maternal death due to severe preeclampsia can be avoided.

The referral system for maternal and neonatal emergency services refers to the main principle of the speed and accuracy of efficient and effective intervention that is in

line with the capabilities and authority of service facilities. Emergency cases that are not immediately handled quickly and appropriately will lead to maternal death and fetus death (Rochjati, 2004; Handriani, 2015).

The requirement in referring obstetric emergency cases is patient stabilization. Stabilizing the patient's condition and referring it quickly and precisely is very important to save midwifery emergency cases, no matter the level of health care (Ministry of Health RI, 2013).

### **3. The Effect of Travel Time on Maternal Death**

Based on the 61 pregnant women with severe preeclampsia with a referral travel time  $\leq 1$  hour, there were 51 pregnant women with severe preeclampsia who lived and 10 pregnant women with severe preeclampsia who died. Patients' referral travel time with severe preeclampsia  $\leq 1$  hour had an effect on maternal mortality. The travel time which is less than one hour is an effort of an effective referral system. Therefore, pregnant women with severe preeclampsia could quickly arrive at the Comprehensive Emergency Neonatal Obstetric Services at Hospital as reference place.

In addition, they will immediately get definitive medical services according to their conditions. Severe preeclampsia is an obstetric emergency condition that needs early treatment and referral as soon as possible.

The main cause of late referral is distance to health facilities. Pregnant women with high risk and obstetric emergencies require good referral access. Referral time must be shortened to save mothers as to reduce the risk of maternal death. Timely referral is required for the successful rescue of an obstetric emergency. Every birth attendant must know the location of a referral facility for obstetric emergencies (Ministry of Health RI, 2013).

### **4. The Effect of Emergency Response Time on Maternal Death**

Based on the 78 pregnant women with severe preeclampsia with a travel time  $\leq 5$  minutes, there were 60 pregnant women with severe preeclampsia who lived and 18 pregnant women with severe preeclampsia who died. Emergency response time  $\leq 5$  minutes had no effect on maternal mortality. Emergency response time is the response time of the emergency care team when the first emergency patient arrives or arrives at the emergency room until the initial emergency treatment is conducted.

Emergency response time is related to the speed of early management of obstetric emergencies in the hospital emergency room. Emergency response time is one part of the service system of the Comprehensive Emergency Neonatal Obstetric Services at the hospital. Emergency response time is directly related to the success of the system of the Comprehensive Emergency Neonatal Obstetric Services, but it is not related to maternal death who had severe preeclampsia.

Emergency response time is one of the criteria of Comprehensive Emergency Neonatal Obstetric Services at the Hospital with a standard time of  $< 5$  minutes. Stabilization in the emergency room and preparation for definitive treatment are the standard emergency services in the emergency room (MOH, 2012).

### **5. The Effect of Operating Room Response Time on Maternal Death**

Based on the 47 pregnant women with severe preeclampsia with a response time  $\leq 30$  minutes, there were 33 pregnant women with severe preeclampsia who lived and 14 pregnant women with severe preeclampsia who died. Surgical response time  $\leq 30$  minutes had an effect on maternal mortality. Operating room response time  $\leq 30$  is the response time of the operating room team on duty. Meanwhile, anesthesia is an obstetric emer-

gency management system of the Comprehensive Emergency Neonatal Obstetric Services at the Hospital starting from the patient being reported to the consultant on duty until surgery in the operating room begins. The faster the operating room response time, the faster the emergency treatment process in pregnant women with severe preeclampsia. Therefore, the maternal and fetal outcomes are getting better. It can reduce the risk of morbidity and mortality of pregnant women with severe preeclampsia. Operating room response time standard of the Comprehensive Emergency Neonatal Obstetric Services at the Hospital for emergency surgery is <30 minutes (Ministry of Health, 2012).

#### **6. The Effect of Delivery Room Response Time on Maternal Death**

Based on the 45 pregnant women with severe preeclampsia with delivery room response time  $\leq 30$  minutes, there were 38 pregnant women with severe preeclampsia who lived and 7 pregnant women with severe preeclampsia who died.

Delivery room response time  $\leq 30$  minutes had an effect on maternal mortality. Delivery room response time  $\leq 30$  minutes is the response time of the midwife care team starts reporting the patient to the consultant on duty, preparing the patient for emergency obstetric surgery, delivering the patient to the operating room until the emergency surgery is started. The faster the preparation made for obstetric emergency patients, the lower the risk of morbidity and mortality in pregnant women with severe preeclampsia. Delivery room response time standard of the Comprehensive Emergency Neonatal Obstetric Services at the Hospital for emergency surgery is <30 minutes (Ministry of Health RI, 2012).

#### **7. The Effect of Giving MgSO<sub>4</sub> on Maternal Death**

Based on the 45 pregnant women with severe preeclampsia who were given MgSO<sub>4</sub>, there

were 34 pregnant women with severe preeclampsia who lived and 11 pregnant women with severe preeclampsia who died. Provision of MgSO<sub>4</sub> to pregnant women with severe preeclampsia did not have any effect on maternal mortality.

Magnesium sulfate is the first choice drug used for the treatment and prevention of seizures in patients with severe preeclampsia. MgSO<sub>4</sub> that was given to the patients with severe preeclampsia was useful for preventing seizure complications that often cause maternal death. MgSO<sub>4</sub> has been proven effective for pregnant women with severe preeclampsia. However, it was not in line with this study that MgSO<sub>4</sub> did not have any effect on the death of pregnant women with severe preeclampsia. It occurred because there were still many midwives who were not quite brave and accustomed to giving MgSO<sub>4</sub> to pregnant women with severe preeclampsia. The death of pregnant women with severe preeclampsia was affected by multi determinants that affected each other. Meanwhile, the determinant effect of MgSO<sub>4</sub> on maternal death with severe preeclampsia in this study was quite small.

Proximate determinant is the closest process to maternal mortality, namely pregnancy and complications during pregnancy, delivery and the puerperium, which are direct causes of maternal death (McCarthy and Maine, 1992). Magnesium sulfate is not a proximate determinant.

Magnesium sulfate is the first choice recommended as first-line therapy for eclampsia and as a prophylaxis for eclampsia in patients with severe preeclampsia patients (HKFM, 2016). Magnesium sulfate is very effective for preventing seizures in pregnant women with severe preeclampsia and stopping seizures in pregnant women with eclampsia, thus reducing the risk of maternal death (Kenny and Baker, 1999). Pregnant women

who have eclampsia are at risk of having aspiration. Aspiration is a main cause of maternal morbidity after eclamptic seizures. The mother must be lying sideways to minimize the risk of aspiration if vomiting occurs. The emergency airway equipment must be available. Eclampsia can cause placental abruption, cerebral hemorrhage and increase the risk of death by 13% (Zekai, 2012).

### **8. The Effect of Giving Nifedipine on Maternal Death**

Based on the 50 pregnant women with severe preeclampsia with Nifedipine, there were 41 pregnant women with severe preeclampsia who lived and 14 pregnant women with severe preeclampsia who died. Nifedipine that was given to the pregnant women with severe preeclampsia did not have an effect on maternal mortality.

Nifedipine is the first choice antihypertensive drug that is safe to use for pregnant women with severe preeclampsia. Nifedipine is easily get, cheap, and available at primary health facilities. Giving oral Nifedipine in pregnant women with severe preeclampsia aims to reduce blood pressure and prevent cerebrovascular disease. Therefore, the risk of complications of severe preeclampsia pregnant women can be avoided. Nifedipine has become a consensus for the management of severe preeclampsia when blood pressure is  $\geq 160/110$  mmHg. Oral Nifedipine is the first choice antihypertensive drug recommended for pregnant women with severe preeclampsia (HKFM, 2016).

In this study, Nifedipine had no effect on maternal mortality, due to the fact that there were still many midwives who had not yet implemented the consensus of giving Nifedipine to pregnant women with severe preeclampsia. Giving oral Nifedipine in people with severe preeclampsia clinically causes a decrease in blood pressure and prevents cardiovascular complications directly.

However, it statistically did not have any effect on maternal mortality, even though it had the potential to prevent the risk of maternal death of severe preeclampsia.

### **9. The Effect of Delivery on Maternal Death**

Based on the 61 pregnant women with caesarean section delivery, there were 52 pregnant women with severe preeclampsia who lived and 9 pregnant women with severe preeclampsia who died. Caesarean section delivery in pregnant women with severe preeclampsia had an effect on maternal mortality.

Pathophysiology of severe preeclampsia is the failure of proliferation of endovascular trophoblast cells that invade the spiral arteries and lumen of the spiral arteries in the myometrium, causing spiral arteries still have reactive elastic muscular walls and vascular resistance (Ramsay et al., 2003).

The process of pathophysiological of preeclampsia is caused by placental factor. Therefore, the ideal therapy is to remove the placenta from pregnant women with severe preeclampsia through the cesarean section delivery process. Removing the placenta by delivery cuts the pathophysiological process of preeclampsia, thus stopping the emergence of severe preeclampsia. Caesarean section is an effective, quick, and appropriate intervention for emergency management of severe preeclampsia which aims to reduce the risk of death of pregnant women with severe preeclampsia.

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