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Analysis of Determinants of Maternal Mortality due to Obstetric Complications at Dr. M. Djamil Padang Hospital in 2017 - 2020

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Abstract. Maternal mortality is one of the unresolved health problems in the world. Obstetric complications directly in maternal mortality (pregnancy complications, childbirth, and the puerperium). This study aims to analyze the relationship between the determinants of maternal mortality due to obstetric complications. This type of research is an observational analytic study with a case-control design. In this study, there were 48 case samples and 144 control samples with a ratio of 1:3. The data obtained in the form of patient medical record data. Data analysed by univariate, bivariate and multivariate. The results showed that the most common cause of maternal death was preeclampsia/eclampsia. Risk factors that have a significant relationship with maternal mortality due to obstetric complications are anemia status (OR: 2.111; CI: 1.053-4.233; p: 0.035), history of maternal disease (OR: 2.514; CI: 1.260-5.015; p: 0.009) and HR (OR: 2.121; CI: 1.062-4.237; p: 0.033). In the multivariate results, the dominant risk factor was a history of maternal disease followed by anemia status and HR. The tendency of mothers who have a history of disease will increase the risk of maternal death compared to mothers who do not have a history of the disease.

Keywords: Determinant, Maternal Mortality, Obstetric Complications

1. INTRODUCTION

Maternal mortality is one of the unresolved health problems in the world. According to the World Health Organization (WHO), the definition of maternal death is death during pregnancy up to a period of 42 days (6 weeks) after delivery. Maternal deaths are generally caused by a lack of health management during pregnancy but not by injury or accident (Alkema et al., 2016). Every day, maternal deaths in the world occur due to complications related to pregnancy and childbirth. Based on data from the World Health Organization (WHO), the maternal mortality rate in the world in 2015 was 216 per 100,000 live births (WHO, 2015). And in 2017 WHO provided data on MMR, which was 211 maternal deaths per 100,000 live births. About 94% of maternal deaths occur in developing countries (WHO, 2019).

McCarthy and Maine developed a conceptual framework of maternal mortality, there are three determinants that affect maternal mortality. The three determinants are divided into near determinants, intermediate determinants and distant determinants. Near determinants are

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factors that directly contribute to maternal mortality, namely obstetric complications (complications of pregnancy, childbirth and puerperium) such as hemorrhage, infection, and preeclampsia/eclampsia, etc. Intermediate determinants are determinants that influence immediate determinants such as maternal health, reproductive status, distance to health facilities, health care behavior, or health care utilization, and unexpected factors. Examples of intermediate determinants are maternal age, parity, health status and history of maternal illness as well as health services in hospitals (human resources, facilities and flow of disease management). Distant determinants are determinants that influence intermediate determinants such as social, cultural and economic factors. Examples of distant determinants are education level, employment status and total income (Reinke et al., 2017).

The causes of maternal mortality are categorized into 2, namely direct causes and indirect causes. Direct causes are those associated with complications of pregnancy, childbirth and the puerperium itself, including hemorrhage, infection, eclampsia, unsafe abortion, and parturition. While indirect causes are caused by complications or diseases that are not related to pregnancy, childbirth, and the puerperium, including heart disease, hypertension, diabetes, hepatitis, anemia, malaria, cancer and Acquired Immuno Deficiency Syndrom (AIDS) (WHO, 2016).

One of the efforts that can accelerate the reduction of maternal mortality in hospitals is through the readiness of referral hospitals in stabilizing the implementation of 24-hour services, especially high-risk obstetric and neonatal emergencies (PONEK hospitals) which can be seen in terms of facilities, human resources and SOPs. Health care facilities such as complete and adequate facilities can reduce the occurrence of maternal mortality. In addition, human resource facilities in handling labor emergencies because they play a major role in health services. Lack of health human resources affects the increase in maternal mortality.

Based on the data obtained, there are still cases of maternal mortality that are still high. There has not been much research on maternal mortality rates in West Sumatra. Government General Hospital (RSUP) Dr. M. Djamil is an interesting case to find reliable information about maternal mortality in West Sumatra. By knowing the risk factors that determine maternal mortality, researchers are interested in conducting research on this matter at Dr. M. Djamil Padang Hospital as the last referral hospital in West Sumatra.

2. LITERATURE REVIEW

The definition of maternal death according to WHO in the International Statistical Classification of Diseases and Related Health Problems-10 (ICD-10) is a woman who dies

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during pregnancy or within a period of 42 days (6 weeks) after the end of pregnancy which includes all causes associated with or aggravated by pregnancy or its handling, but not caused by injury or accident (Alkema et al., 2016).

The causes of maternal death according to the ICD-10 issued by WHO are divided into two groups, namely direct and indirect. A measure of the success of modern community services is reflected in the Maternal Mortality Rate (MMR), which has decreased in many countries. When compared to developed countries, the maternal mortality rate in Indonesia is still relatively high. Based on WHO data, the maternal mortality rate in the world in 2015 was 216 per 100,000 live births (WHO, 2015). The maternal mortality rate in West Sumatra province is still relatively high, which amounted to 111 people in 2015 and decreased in 2016 which amounted to 107 people (Artati et al., 2016). According to McCarthy and Maine, there are 3 factors that influence the occurrence of maternal deaths, namely near determinants, intermediate determinants, and distant determinants.

3. RESEARCH METHOD(S)

¹²
The study population consisted of case population and control population. The case population is all maternal deaths due to obstetric complications that occurred at Dr. M Djamil Padang General Hospital in 2017-2020. The control population is pregnant women who have obstetric complications and are still alive at Dr. M. Djamil Hospital Padang in 2017-2020.

The sample of this study was taken from the case population and the control population. The case group sample in this study were all maternal deaths due to obstetric complications during 2017-2020 and data obtained from the medical records of Dr. M. Djamil Padang Hospital with the sampling technique using the total sampling technique. While the control group samples in this study were pregnant women who experienced obstetric complications and were still alive who were recorded in the medical records of Dr. M. Djamil Padang Hospital in 2017-2020 with the systematic sampling technique. In this study, 48 case samples and 144 control samples were obtained in a ratio of 1: 3. The data collected is secondary data based on medical records with data editing, coding, data entry, cleaning and then analyzed using univariate, bivariate and multivariate analysis.

The variables in this study consisted of dependent variables and independent variables. The dependent variable was maternal mortality due to obstetric complications and the independent variables were age, parity, anemia status, history of maternal illness, health care facilities, health human resources, education and employment.

This study has received ethical approval from the health research ethics committee with letter number 306/KEPK/2021.

4. FINDINGS

4.1 Characteristics of research subjects

This study was conducted at Dr. M. Djamil Padang Hospital using an observational analytic method with a case control design. The subjects of this study were medical record data of all maternal and maternal deaths at Dr. M. Djamil Padang Hospital in 2017-2020. In this study, the number of case samples that met the inclusion criteria was 48 cases and the exclusion criteria were 6 cases. The ratio of the number of cases and controls in this study was 1: 3. The control sample of this study were pregnant women who had obstetric complications and were still alive. The number of control samples that met the inclusion criteria amounted to 144 people. So the total number of samples is 192 samples. The data obtained from the research were then collected and analyzed, the following is a description of the results of data analysis and research results.

Table 4.1. Causes of Maternal Deaths Due to Obstetric Complications

Obstetrics Complication	Deaths	
	f	%
Direct Cause :		
Preeclampsia/eclampsia	24	50%
Acute Lung Oudema	11	20%
HELLP Syndrome	13	30%
Postpartum Hemorrhage	9	17%
Atonia Uteri	8	13%
Retensio Plasenta	1	2%
Plasenta Previa	4	9%
Abortus Hemorrhage	1	2%
Indirect Cause	10	22%
Cardiovascular Disease	4	10%
HIV	2	4%
SLE	1	2%
Lung Tuberculosis	1	2%
Kidney Disease	1	2%
Ca Mammar	1	2%
Total	48	100%

Based on table 1, the pattern of causes of maternal death due to obstetric complications in 48 cases at Dr. M. Djamil Padang General Hospital in 2017-2020 shows that half of the cases were preeclampsia / eclampsia, followed by postpartum hemorrhage, placenta previa, abortion bleeding and other indirect causes. Indirect causes of maternal deaths that occur include cardiovascular disease, HIV, SLE, pulmonary tuberculosis, kidney disorders, and ca mammae.

Table 4.2. Timing of maternal deaths at the hospital

Timing of maternal deaths at the hospital	Deaths	
	f	%
< 2 hours	2	4%
Preeclampsia/eclampsia		
Heart Disease		
> 2 hours	46	96%
Total	48	100%

Based on table 2, the time of maternal deaths at Dr. M. Djamil Padang Hospital mostly occurred within > 2 hours, which means that the handling of pregnancy complications experienced by mothers has been carried out in accordance with the available flow.

Table 4.3. Characteristics of patients with obstetric complications based on intermediate and remote determinants

Variables	Maternal Mortality				Total	
	Yes		No			
	f	%	f	%	f	%
5						
Mother's age						
At Risk (<20 years old or >35 years old)	13	27,1	52	31,6	65	33,9
Not At Risk (20-35 years old)	35	72,9	92	63,9	127	66,1
Parity						
At Risk (<1 dan >4)	11	22,9	41	28,5	52	27,1
Not At Risk (1-4)	37	77,1	103	71,5	140	72,9
Anemia Status						
Anemia	30	62,5	59	41	89	46,4
Not Anemia	18	37,5	85	59	103	53,6
Mother's Medical History						
Existing (>= 1 history disease)	29	60,4	52	36,1	81	42,2
None	19	39,6	92	63,9	111	57,8
Means						
Incomplete	1	2,1	7	4,9	8	4,2
Complete	47	97,9	137	95,1	184	95,8
HR						
Non-high risk doctor	29	60,4	58	40,3	87	45,3
High risk doctor	19	39,6	86	59,7	105	54,5
Education						
Low (<= JHS)	16	33,3	34	23,6	50	26
High (>JHS)	32	66,7	110	76,4	142	74
Jobs						
Not Working	40	83,3	106	73,6	146	76
Work	8	16,7	38	26,4	46	24

Table 3 above shows the characteristics of maternal deaths due to obstetric complications mostly occur at a healthy reproductive age, parity that is not at risk, mothers with anemia, mothers who have a history of disease, complete facilities, availability of health human resources in terms of high-risk doctors, mothers who have high education and mothers who do not work.

Table 4.4 Relationship between distant and intermediate determinants and maternal mortality due to obstetric complications

Variables	CI	OR	P
Age	0,319 - 1,352	0,657	0,293
Parity	0,348 - 1,604	0,747	0,574
Anemia Status	1,226 - 4,702	2,401	0,012
Mother's Medical History	1,380 - 5,283	2,700	0,004
Means	0,050 - 3,474	0,416	0,682
HR	1,161 - 4,412	2,263	0,019
Education	0,793 - 3,299	1,618	0,189
Jobs	0,770 - 4,172	1,792	0,241

¹⁰ In table 4 based on the results of bivariate analysis, it is found that the variables of anemia status, history of maternal illness and health human resources have a significant relationship with maternal mortality due to obstetric complications.

Table 4.5. Multivariate Analysis Results

Variabel	B	value	OR	CI	
				Lower	Upper
HR	0,752	0,033	2,121	1,062	4,237
Anemia Status	0,747	0,035	2,111	1,053	4,233
Mother's Medical History	0,922	0,009	2,514	1,260	5,015
constant	-0,113	0,725	2,031		

¹⁰ Table 5 based on the results of multivariate analysis shows that the history of maternal disease has the largest OR value, which means that the tendency of respondents who have a history of maternal disease can increase the risk of death by 2.514 times greater than respondents who do not have a history of disease.

5. DISCUSSION

5.1 Frequency of Causes of Maternal Death due to Obstetric Complications

In the research conducted, most of the frequency of causes of maternal death due to obstetric complications that occurred at Dr. M. Djamil Padang General Hospital in 2017-2020 was preeclampsia / eclampsia, followed by postpartum hemorrhage, placenta previa, abortion bleeding and indirect causes such as cardiovascular disease, HIV, pulmonary tuberculosis, kidney disorders, and ca mammae. ³ The results of this study are in line with research conducted by Uce Siswi Prihesti et al. (2019) at Dr. Sardjito General Hospital, where the most common cause of maternal death due to obstetric complications in 2012-2017 was preeclampsia/eclampsia (WHO, 2015). Preeclampsia/eclampsia is a triad of major complications of maternal death. The cause of maternal mortality due to preeclampsia/eclampsia in Indonesia is still quite high compared to Southeast Asia or the world. HELLP syndrome is a strong predictor of death in pregnant women with severe preeclampsia. However, deaths due to eclampsia can be prevented with good antenatal monitoring and care and with simple technology (Profil Kesehatan Indonesia, 2018).

5.2 Age Characteristics and Their Relationship with Maternal Mortality Due to Obstetric Complications

In the study conducted, ¹ the results of univariate analysis of the age of mothers at risk in the control group were greater than the case group. Based on these results, ³ there was no significant relationship between maternal age and maternal mortality due to obstetric complications. In this study, ⁴ many maternal deaths occurred at a healthy reproductive age. Thus, the hypothesis ⁴ that there is a relationship between maternal age risk factors and the risk of maternal death due to obstetric complications is rejected. From these results ⁴ it can be seen that most maternal deaths due to obstetric complications occur at the age of 20 - 35 years. When viewed in terms of age, the 20 - 35 year category includes healthy reproductive age. However, most of the deaths that occurred at that age already had a history of previous illness. This can mean that although many maternal deaths occur at a healthy reproductive age, these maternal deaths can be aggravated by a history of disease that existed before pregnancy. According to Supriadi Hari Respati et al. (2019) in Sukoharjo Regency, most maternal deaths occurred in the 20-35 year age group, while fewer maternal deaths occurred in

the at-risk age group. The results of the analysis stated that the maternal age factor had no effect on maternal mortality due to obstetric complications (Kementrian Kesehatan RI, 2019).

5.3 Characteristics of Parity and its Relationship with Maternal Mortality Due to Obstetric Complications

In the research conducted, the results of univariate analysis of risky parity in the control group were greater than the case group. Based on these results, it was concluded that there was no significant relationship between the risk factor of parity and maternal mortality due to obstetric complications. This occurred because most of the pregnant women were at non-risk parity and the safest parity group in terms of reproductive health. The results of this study are in accordance with research conducted by Farid Zein et al. (2014) in Bandung stated that there was no significant relationship between parity and maternal mortality due to obstetric complications.⁹ However, this study is not in line with research conducted by Rizky Rakhman (2018) in Banjar which states that there is a relationship between parity and maternal mortality due to obstetric complications. This is because a high number of parities also causes a high risk of death (Dinkes Sumbar, 2017).

5.4 Characteristics of Anemia Status and Its Relationship with Maternal Mortality Due to Obstetric

Complications In the research conducted, the results of univariate analysis of anemia status in the case group were greater in anemia compared to the control group. Based on these results, it was concluded that there was a significant relationship between the risk factor of anemia status and maternal mortality due to obstetric complications. The results of this study are in line with research conducted by Abiyyi Pratama (2020) which states that there is an influence of anemia on maternal mortality due to obstetric complications. A common cause of anemia in pregnancy is iron deficiency anemia. Iron deficiency anemia is the main cause of bleeding, prolonged partus, and infection which are the main factors of maternal mortality (Dinas Kesehatan Kota Padang, 2019). This is also supported by research conducted by Aryani and Rokhanawati (2017) at Penembahan Senopati Bantul Hospital which states that there is a relationship between anemia during pregnancy and the incidence of postpartum hemorrhage. In a study conducted by Aryani and Rokhanawati, the OR value = 5.096 was obtained, which means that mothers who are anemic during

pregnancy are more at risk of postpartum hemorrhage five times than pregnant women who are not anemic (Astuti et al., 2017).

5.5 Characteristics of Maternal Medical History and Its Relationship with Maternal Mortality Due to Obstetric Complications

In the research conducted, the results of univariate analysis of maternal medical history in the case group were greater than the control group. Based on these results, it was concluded that there was a significant relationship between the risk factors of maternal medical history and maternal mortality due to obstetric complications. The previous history of disease owned by the mother includes hypertension, diabetes mellitus (DM), pulmonary tuberculosis, heart defects, hyperthyroidism, asthma and ca mammae. The results of this study are in line with research conducted by Krisnita Dwi Jayanti et al. (2016) which found that a history of disease is at risk of maternal mortality. The history of disease suffered by the mother is heart, asthma, tuberculosis, hepatitis, lupus, HIV and lung cancer. A history of maternal illness such as hypertension is a risk factor for maternal mortality. Based on research conducted by Krisnita Dwi Jayanti et al. also obtained an OR value = 8.899 which means that pregnant women who have a history of disease have a risk of dying 8.8 times higher than mothers who do not have a history of disease (Prawirhohardjo, 2009). Research on risk factors for maternal mortality in Pati Regency stated that the history of maternal disease affects maternal mortality, where mothers who have a history of disease increase the risk of maternal death about 27.74 times greater than mothers who do not have a history of disease (Say et al., 2014). In addition, research conducted by Regina Pingkan at Abdul Moeloek Hospital Bandar Lampung, states that mothers who experience heart disease during pregnancy have a significant relationship with maternal mortality. Heart disease will become more severe during pregnancy because it can affect fetal growth disorders.

5.6 Characteristics of Health Care Facilities and Their Relationship with Maternal Mortality Due to Obstetric Complications

In the research conducted, most of the facilities at health care facilities in both the case group and the control group were sufficient. Based on these results, it was concluded that there was no significant relationship between the risk factors of health care facilities and maternal mortality due to obstetric complications. So it can be concluded that sufficient facilities are not a problem for maternal mortality. Incomplete

facilities referred to in this study are an action that cannot be taken because it does not get approval from the family in carrying out the action. Sufficient health care facilities are in the form of supporting examinations such as labor, ECG, CTG, ultrasound, blood transfusion, ICU / NICU, and operating rooms. In the results of the study conducted, health care facilities did not have a significant relationship with the incidence of maternal mortality due to obstetric complications. According to WHO, maternal mortality is closely related to access to quality health services (Bale et al., 2003). Increased access to quality health services has a positive effect on providing opportunities for mothers to get pregnancy examinations, delivery assistance, and good treatment. Quality health services are an interrelated aspect of efforts to reduce MM (Kementrian Kesehatan Republik Indonesia, 2014).

5.7 Characteristics of Health Human Resources and their Relationship with Maternal Mortality due to Obstetric Complications

In this study, maternal deaths based on health human resources were mostly cases accounted for by non-risk doctors with 27 maternal deaths and those accounted for by risk doctors amounted to 19 maternal deaths. Based on these results, it can be concluded that there is a significant relationship between health human resources and maternal mortality due to obstetric complications. The placement of hospital classification is based on 3 main aspects, namely human resources, equipment, and buildings and infrastructure. Based on the Regulation of the Minister of Health of the Republic of Indonesia No. 30 of 2019, general hospitals are hospitals that provide health services in all fields and types of diseases. Dr. M. Djamil Padang General Hospital is a class A general hospital which means that it must have medical service facilities and capabilities of at least 4 basic specialist medical services, 5 specialist medical support services and 12 other specialist medical services and 13 subspecialist medical services. Risk doctors in this study are cases managed by fetomaternal subspecialist obstetricians. Based on Perkonsil No. 87 of 2020 concerning the obstetrics and gynecology subspecialist education curriculum, it states that fetomaternal subspecialist obstetricians are obstetricians and gynecologists who study the knowledge of diseases and complications in pregnant women and fetuses. These specialists have more competence to diagnose and manage abnormalities in pregnant women (Mariati et al., 2011). Therefore, high-risk obstetric complications should be managed by subfetomaternal specialists. The results of research in Tanzania also stated

that delivery assistance must be carried out by health workers such as doctors, midwives and nurses and must be supported by the availability of complete and adequate facilities so that this is very important to reduce maternal and infant mortality (Respati et al., 2019).

5.8 Educational Characteristics and Their Relationship with Maternal Mortality Due to Obstetric Complications

In the research conducted, the results of univariate analysis on low maternal education were found more in the case group compared to the control group. Based on these results, it was concluded that there was no significant relationship between education and maternal mortality due to obstetric complications. This is because the relationship between education and maternal mortality is not direct, meaning that even though someone has a high or low education it cannot directly cause maternal death. Not necessarily people with low education do not know how to take care during pregnancy so as not to cause complications that result in death or vice versa. This study is in line with research conducted by Supriyadi Hari Respati et al. (2019) in Sukoharjo Regency which states that education has no relationship with maternal mortality due to obstetric complications (Kemetrian Kesehatan RI, 2019). Likewise, research conducted by Fauzi Ahmad (2020) in Padang City states that education has no role in maternal mortality.

5.9 Characteristics and Their Relationship with Maternal Mortality Due to Obstetric Complications

In the research conducted, the results of univariate analysis of maternal employment in the control group have higher employment compared to the case group. Based on these results, it was concluded that there was no significant relationship between occupation and maternal mortality due to obstetric complications. This is because employment is a distant determinant of maternal mortality. The relationship between occupation and maternal mortality is indirect. The results of this study are in line with research conducted by Supriyadi Hari Respati et al. (2019) in Sukoharjo Regency which states that there is no relationship between maternal employment and maternal mortality due to obstetric complications (Kementrian Kesehatan RI, 2019). Although it is possible that mothers who have heavy work will affect their pregnancy,

it takes a long time for that, and is influenced by many factors such as the nutritional status of the mother.

5.10 The Most Dominant Risk Factor

The most dominant risk factor can be done by multivariate test. In this study, statistical tests using logistic regression were used. There were three variables that were risk factors that had a strong association with maternal mortality due to obstetric complications, namely anemia status ($p = 0.035$; $OR = 2.111$; $95\% CI = 1.053 - 4.233$), maternal disease history ($p = 0.009$; $OR = 2.514$; $95\% CI = 1.260 - 5.015$) and health human resources ($p = 0.033$; $OR = 2.121$; $95\% CI = 1.062 - 4.237$). This shows that mothers who have a history of disease will increase the risk of death by 2.514 times greater than mothers who do not have a history of disease. The results showed that the cases of mothers who died at Dr. M. Djamil Padang Hospital were pregnant women who had a history of previous illnesses consisting of hypertension, DM, pulmonary tuberculosis, heart problems, kidney problems and ca mammae. This study is in accordance with research conducted by Krisnita Dwi Jayanti et al. ($p = 0.001$; $OR = 8.899$; $95\% CI = 2.759 - 28.701$) (Ndiaye et al., 2018). Based on the results of this study, it can be concluded that a history of disease suffered by the mother before pregnancy can increase the risk of maternal death. For this reason, early detection of diseases that accompany the mother is needed so that complications do not occur in her pregnancy.

6. CONCLUSION AND RECOMMENDATION

Based on the results of the study, it was concluded that anemia status, history of maternal illness and health human resources were associated with maternal mortality due to obstetric complications. History of maternal illness is the most dominant variable in the occurrence of maternal mortality due to obstetric complications. For the community, it is expected to know the causes of maternal mortality in the last four years and can be used as evaluation material to prevent the factors that cause cases that occur in the community. Other researchers are expected to conduct further research on the factors causing maternal mortality due to obstetric complications by considering other determinants such as history of infection during pregnancy, nutritional status, history of complications in previous pregnancy and childbirth, access to health services, history of ANC examination and mother's income.

7. ACKNOWLEDGEMENT

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