Risk Factors for Maternal Mortality in Banyumas Regency in 2022

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Abstract

Introduction: Maternal mortality Rate (MMR) in Banyumas Regency, Indonesia fluctuates. In 2022, it was the highest in Central Java Province with 24 cases spread across 14 Puskesmas. The purpose of this study was to determine the risk factors affecting maternal mortality consisting of maternal education level, anemia status, nutritional status, and history of infectious diseases.

Methods: This type of research was a case control study with a sample size of 24 cases and 48 controls. The sampling method was total sampling. Education level, infectious disease, anemia, and nutritional status were investigated. This study was conducted on July to September 2023 in Banyumas Regency, Central Java, Indonesia. Data were collected through interviews using structured questionnaires. Data were analyzed with chi square tests and logistic regression.

Results: The results showed that factors that increase the risk of maternal mortality were having a history of infectious diseases (OR = 5.84; 95% CI = 1.46 - 23.33, p = 0.012) and maternal Chronic Energy Deficiency (OR = 3.98; 95% CI = 1.32 - 12.01, p = 0.014).

Conclusion: The risk factors for maternal mortality were infectious diseases and maternal Chronic Energy Deficiency. Early detection of risk factors such as history of infectious disease and Chronic Energy Deficiency are needed so prevention efforts can be planned. The improvement of antenatal and postnatal care through increasing the quality of health workers by providing technical and non-technical skills, especially village midwives is very important.

Keywords : Risk Factor, Maternal Mortality, Infectious Disease, Chronic Energy Deficiency

Introduction

Maternal Mortality Rate (MMR) is a basic indicator to assess the quality of maternal or women's health services during the reproductive period. Maternal mortality itself is defined as the death of a woman that occurs during pregnancy or within 42 days after the end of pregnancy, regardless of the length and location of pregnancy, by any cause related to or aggravated by pregnancy or its handling but not by accident or incidental[1]. MMR is still a considerable problem in various countries, especially in developing countries with all

the risk factors that affect it[2]. Maternal Mortality Rate (MMR) is still a considerable problem in various countries, especially in developing countries. The estimated MMR in developing countries reaches 415/100,000 live births (KH), while developed countries have an MMR of 12/100,000 KH[3].

Maternal mortality is a complex event caused by various causes that can be divided into near, intermediate, and distant determinants[4]. Near determinants that are directly related to maternal mortality are obstetric disorders such as bleeding, preeclampsia/eclampsia, and infections or diseases suffered by the mother before or during pregnancy that can worsen pregnancy conditions such as heart disease, malaria, tuberculosis, kidney disease, and acquired immunodeficiency syndrome. Near determinants are directly influenced by intermediate determinants related to health factors, such as maternal health status, reproductive status, access to health services, and health facility use behavior. The distant determinants are related to demographic and sociocultural factors. Low public awareness about maternal health, poor women's empowerment, educational background, family socioeconomics, community and political environment, and policies are thought to indirectly play a role in increasing maternal mortality[5].

A high maternal mortality rate in a region essentially reflects a low level of public health and has the potential to cause economic and social setbacks at the household, community and national levels. However, the greatest impact of maternal mortality is that it reduces the quality of life of infants and children, causing turmoil in the family and further affecting child development[6]. To reduce MMR, the Ministry of Health of the Republic of Indonesia launched Making Pregnancy Safer (MPS), which is implemented in the Jampersal program to ensure that all deliveries are carried out in health facilities and by trained health workers and the provision of basic emergency obstetric neonatal services (PONED) and comprehensive emergency obstetric neonatal services (PONEK) to ensure that all obstetric complications can be handled optimally. In addition, the Ministry of Women's Empowerment also launched the Maternal Compassion Movement (GSI) as an effort to raise awareness that pregnancy and birth can pose risks and are not only the responsibility of the mother, but also the family, husband, parents, and community[7].

Despite many efforts to reduce maternal mortality, a number of regions in Indonesia still have a high MMR. One of the regions in Indonesia with high MMR is Central Java Province, with Banyumas Regency contributing the highest number of maternal deaths with 24 cases in 2022. Based on information from the Family Health and Community Nutrition Section of Banyumas Regency, during January-December 2022 there were 24 new cases of maternal deaths spread across 14 Puskesmas,namely Puskesmas Sumpiuh 1(1 case),Puskesmas Purwojati (4 cases), Puskesmas Sumbang 2 (2cases), Puskesmas Pekuncen 2 (3cases), Puskesmas Sokaraja 2 (1 case), Ajibarang Health Center 2 (1 case), Cilongok Health Center 1 (1 case), Karanglewas Health Center (1 case), Gumelar Health Center (1case),Kembaran Health Center 2 (2cases), Purwokerto Utara Health Center 2 (1 case), Banyumas Health Center (1 case), Patikraja Health Center (2cases),Sumbang Health Center 1(1case), Purwokerto Selatan Health Center (1 case), Ajibarang Health Center 1 (1 case). Most of the death cases (87.5%) were reported in the hospital, 8.3% occurred during the hospital trip, 4.2% occurred at home[8].

Banyumas Regency Government has implemented various operational strategies for Family Health/Maternal and Child Health programs such as EMAS Program (Expanding Maternal and Neonatal Survival) in 2011-2016 and HOPE Program in 2019-2022 to reduce the Maternal Mortality Rate (MMR). However, the maternal mortality rate (MMR) in Banyumas Regency on 2021 was the highest in Central Java Province. Covid-19 pandemic also has an impact on maternal and neonatal services both in terms of access and quality. An analysis of the risk factors for maternal mortality during the Covid-19 pandemic 2022 has never been conducted in Banyumas Regency. This study was expected to find the causes of the increase in maternal mortality in Banyumas Regency

and become a consideration for future program progress.

Methods

This study was an observational analytic, using a case-control design. The subjects were 72 mothers (24 as the case and 48 others as controls). The minimal sample size was obtained through the multiple control formula. The cases were taken from all maternal death cases in Banyumas Regency in 2022, while the controls were mothers who lived in the same village as the cases, who gave birth and had a close gestational age or delivery time. The subjects were chosen from the village midwife register through simple randomization. Primary data collection in cases of maternal death was done through interviews using structured questionnaires to the deceased mother's family (husband, parents, siblings, or in-laws) who knew the history of maternal death. In the control group, primary data were collected by interviewing postpartum mothers who met the requirements of the study. Secondary data were collected from maternal death records, delivery records, pregnant women cohort registers, and verbal autopsy documents.

The dependent variable in this study was maternal mortality, while the independent variables studied included maternal education level, history of infectious diseases, anemia status, and nutritional status. The analysis was done through Chi squared tests, and multivariate analysis through multiple logistic regression of the determinant model. Variables that were included in the multivariate model were variables that in the bivariate test had a p value of <0.25. Determination of the logistic regression model was carried out in stages. Variables that are suitable for the model are variables that have a p value of <0.05, so variables that did not meet the value criteria were excluded from the model.

Results

From 24 maternal deaths recorded at the Health Office, all families were contacted and agreed to participate in the study. Subjects were spread across 14 sub-districts in Banyumas Regency. Most of the maternal deaths occurred during the postpartum period, 17 (70.8%), 4 (16.7%), and 3 (12.5%) during pregnancy. The highest causes of death were infectious diseases (37.5%), preeclampsia/eclampsia (29.2%), bleeding (25%), and autoimmune (8.3%), as shown in Table 1.

The proportion of maternal risk factors based on the education level variable showed that the low education level category (elementary to junior high school) was more in the case group (66.7%) compared to the control group (47.9%). In the infectious disease variable, 9 subjects (37.5%) in the case group had infectious diseases during pregnancy, while in the control group there were 4 subjects (8.3%) who had infectious diseases. A total of 6 respondents (25%) had anemia during pregnancy, while in the control group there was 1 person (2.1%) who had anemia. In term of nutritional status, 16 respondents (66.7%) in the case group were categorized as Chronic Energy Deficiency (CHD), while in the control group, 15 respondents (33%) experienced CHD during pregnancy (Table 2).

Table 1. Categories of Causes of Maternal Mortality

Causes of Maternal Mortality	Category	Total	Percentage (%)
Direct causes	Bleeding	6	25.0
	Preeclampsia/eclampsia	7	29.2
	Infection	9	37.5
Indirect cause	Autoimun disease	2	8.3
	Total	24	100

Table 2. Proportion of Risk Factors for Maternal Mortality

Independent Variable	Category	Cases		Control	
		N	%	n	%
Education Level	Low	16	66.7	23	47.9
	High	8	33.3	25	52.1
Infectious Diseases	Yes	9	37.5	4	8.3
	No	15	19.7	44	91.7
Anemia	Yes	6	25	1	2.1
	No	18	75	47	97.9
Nutritional Status	Chronic Energy Deficiency	16	66.7	15	33
	Not Chronic Energy Deficiency	8	33.3	31	68.8

The results of bivariate analysis showed that the risk factors showed that increase the risk of maternal death were infectious diseases, anemia status, and nutritional status. Infectious diseases could increase the risk by 6.6 times compared to pregnant women who did not have a history of infectious diseases. Pregnant women with anemia had a risk of 15.66 times compared to pregnant women who do not have anemia. Pregnant women with chronic energy deficiency have a risk of 4.4 times compared to pregnant women who were not in chronic energy deficiency, as shown in Table 3.

Multivariate analysis was performed with logistic regression on risk factors that had a p value <0.25 in bivariate analysis, to determine how big the influence of these risk factors to the incidence of maternal mortality. Based on the results of bivariate

analysis, there were four risk factors that had a p value <0.25, namely education level, infectious diseases, anemia status, and nutritional status. Multivariate logistic regression analysis using the enter method obtained two risk factors that contributed to the incidence of maternal mortality in Banyumas Regency in 2022, as shown in Table 4.

In Table 4, it can be seen that mothers with undernutrition status have an increased risk of maternal mortality by 3.98 times compared to pregnant women who are good nutritional status. Mothers with infectious diseases increased the risk of maternal mortality by 5.84 times compared to pregnant women who did not have a history of infectious diseases. Of the two factors, infectious disease is the most dominant factor increasing the risk of maternal mortality in Banyumas Regency in 2022.

Table 3. Crude OR of Risk Factors Associated with Maternal Mortality

Independent Variable	OR	95% CI	*P value*
Education Level	2,17	0.78-6.03	0.210
Infectious Diseases	6,60	1.77-24.59	0.007
Anemia	15,66	1.76-139.37	0.005
Nutrition Status	4,40	1.54-12.51	0.009

Table 4. Adjusted OR of Maternal Mortality Risk Factors in Banyumas Regency in 2022

Independent Variable	*p value*	OR	95% CI	
			Lower Limit	*Upper Limit*
Nutrition Status	0.014	3.98	1.32	12.01
Infectious Diseases	0.012	5.84	1.46	23.33

Discussion

Overview of Maternal Mortality

The causes of maternal mortality in Central Java Province in 2022 were hypertension, hemorrhage, infectious

diseases and heart diseases[9]. While Maternal deaths in Banyumas Regency in 2022 were mostly caused by infection, preeclampsia/eclampsia, and bleeding. These results are in accordance with the

results of the Maternal and Child Health Profile in 2022 which found that the three main causes of maternal death in Indonesia were bleeding, preeclampsia/eclampsia, and infection[10]. Based on the distribution in 2022, maternal deaths occurred in 14 Puskesmas out of 40 Puskesmas in Banyumas Regency, with the most deaths in Purwojati Puskesmas and Pekuncen 2 Puskesmas.

Based on the time of occurrence, most maternal deaths occurred in the postpartum period. In Central Java, in 2022, more than half of maternal deaths occurred during the postpartum period[11]. In this study, most maternal deaths occurred during the postpartum period 17 subjects (70.8%), delivery 4 subjects (16.7%), and during pregnancy 3 subjects (12.5%). This condition indicated that the supervision mechanism after delivery by medical personnel was still weak. Therefore, the Banyumas Regency Health Office has instructed midwives to conduct four-handed deliveries (two midwives handling the delivery), so that the condition of the mother and baby after delivery can be monitored, but this recommendation has not been fully implemented[12].

In addition, cultural factors and traditions still play a role in the postpartum care process through the influence of families who play a role in postpartum care. Some of these practices include abstinence and or the need to consume certain foods. During the postpartum period, mothers only eat white rice without animal protein and limit water consumption because it is considered to slow down the wound healing process. This can reduce the condition of postpartum mothers who need adequate nutritional intake to restore body condition and help the breastfeeding process[13].

Risk Factors for Maternal Mortality

Three of the four variables in the bivariate analysis were significantly associated with maternal mortality, including infectious diseases, anemia status, and nutritional status. However, in the multivariate model, only infectious diseases and nutritional status had an effect on maternal mortality. A history of infectious disease increased the risk of maternal death by 5.84 times (95% CI = 1.46 - 23.33; p value = 0.012). This was consistent with research conducted in Ethiophia (p value = 0.001)[14]. Another study also stated that a history of infectious disease (Corona Virus) contributed to maternal mortality in Washington State[15]. Another study also stated that infectious disease (Covid-19) during pregnancy was consistently associated with and substantially increased the severity of maternal morbidity and mortality[16].

Maternal mortality due to diseases suffered before pregnancy can basically be prevented by early detection. This does not seem to be the concern for health workers who conduct antenatal checks. Observation of pregnancy examination books in the case group found that almost all of them did not include a history of infectious diseases. From interviews with the family and observations, it was known that the mother had a history of infectious diseases before pregnancy. The most common infectious diseases were tuberculosis and pneumonia[17].

Mothers with undernutrition status during pregnancy increased the risk of maternal death by 3.98 times (95% CI = 1.32 - 12.01; p value = 0.014). Undernutrition is one of the risk factors for preeclampsia where preeclampsia is the leading cause of maternal and perinatal morbidity and mortality worldwide. The literature review study conducted by Bekti et al. also stated that undernutrition status was associated with the incidence of preeclampsia[18]. Another study also mentioned that there was an association between Chronic Energy Deficiency and maternal mortality[19]. Research conducted in Probolinggo stated that there was an association between Chronic Energy Deficiency and maternal mortality[20]. One of the risk factors for preeclampsia was undernutrition status, where undernutrition status determined the health of pregnant women and fetuses. In pregnant women who experienced undernutrition status, preeclampsia can occur through the mechanism of hyperleptinemia, metabolic syndrome, inflammatory reactions, and increased oxidative stress which leads to endothelial damage and dysfunction[21].

Conclusion

A history of infectious disease and maternal chronic undernutrition have been shown to increase the risk of maternal mortality in Banyumas Regency in 2022. Improving the quality of counseling on the importance of pregnant women to consume a balanced diet, especially one that contains plenty of iron and protein, is needed. Early detection of risk factors such as complications and history of infectious diseases is needed so that optimal prevention efforts can be made. It is necessary to improve the quality of antenatal and postnatal services, including by improving the quality of health workers by providing technical and nontechnical skills, especially to midwives who work in villages.

Ethics approval

This study has been declared ethically sound by the Health Research Ethics Commission (KEPK) of the Faculty of Health Sciences, Jenderal Soedirman University with Number: 1144/EC/KEPK/VI/2023.

Availability of data and materials

Available

Author Contribution

LN and PWH conducted data analysis and interpretation of research results. JDM assisted in data collection. AAA prepared the manuscript. All authors read and approved the final manuscript.

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