

Analysis of Maternal Mortality Determinants in Gowa District South Sulawesi Province, Indonesia

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Abstract Objective We investigated the risk factors associated with maternal mortality determinants in Gowa District of South Sulawesi Province, Indonesia. **Methods** A case control retrospective study was carried out to determine the pattern of maternal mortality. Primary data were collected through interviews with a structured questionnaire guidelines. Secondary data obtained through maternal death records, pregnant women cohort registers, medical records and verbal autopsy documents. **Findings** There were 5 variables evaluated as determinant factors of maternal mortality in this study. The predictors found in this study were: chronic energy insufficiency 37.1% in case group and 5.7% in control group, anemia were found 40.0% in case group and 7.9% in control group respectively, presence of maternal illnesses history were 37,1% and 15,0% in case and control groups, respectively, obstetric complications found in 14,3% in case group and 9,3% in control group. Statistical analysis of high-risk pregnancy was found with OR = 9.750, meaning, women with high risk have almost 10 times having maternal death compared to low risk women. **Conclusion** High risk of health status has a significant influence on maternal mortality in Gowa District of South Sulawesi Province, Indonesia

Keywords: maternal mortality, determinants, high risk, health status

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1. Introduction

The maternal mortality ratio is an annual number of deaths of women from pregnancy related causes per 100,000 live births [1]. According to the World Health Organization, 99% of maternal mortality occurred in developing countries [2]. Maternal mortality in developing countries is 18 times higher than in the developed countries [2,3]. The Republic of Indonesia is the world's fourth most populous nation, with a population of approximately 240 million. Indonesia has high maternal mortality ratio (MMR), 190 per 100,000 live births in 2013. Indonesia has committed to achieving the Millennium Development Goals (MDGs), reduction of maternal mortality is a key developmental goal [4]. The need for reducing maternal mortality has become a major concern in developing countries including Indonesia. The provision of antenatal care (ANC) is one strategy to reduce maternal mortality in Indonesia [5].

A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes [6]. A hospital based study from south India found that the leading causes of death were sepsis,

especially septic abortion; eclampsia-severe preeclampsia; ruptured uterus; and hemorrhage and prolonged labor. Hepatitis, heart disease, and severe anemia were leading in indirect obstetric causes of death [7].

Anemia is a common health problem among pregnant women, a contributing factor with a major influence on maternal mortality in Indonesia [8]. A report from Nigeria has highlighted the importance of maternal anemia as a contributory factor to maternal mortality. WHO estimates the global burden of deaths attributable to anemia in women of reproductive age [9]. Maternal nutritional status is an important factor that affects the pregnancy outcomes. High prevalence of maternal mortality in developing countries caused by negative outcome of poor prenatal nutritional status. The contribution of maternal nutritional status to the mortality rate is unknown. However, Chronically energy deficient in women with short stature and low body weight), or both are considered to be at risk of adverse pregnancy outcomes [10].

Maternal mortality is the culmination of a series of detrimental events, pregnancy being the last one in a woman's life [11]. The preventable causes of maternal mortality and factors contributing to death must be identified to reduce the incidence [12]. In this study we investigated the risk factors associated with maternal mortality determinants in Gowa District of South Sulawesi Province, Indonesia.

2. Methods

We performed a matched case control analysis in the population-based survey to examine the determinants of maternal mortality. Cases were all maternal deaths between April 2013 and April 2014; match control are all women who reported to have given birth within the last 3 years. Geographical position of neighboring house between case and control was used as matching. The sample size was determined based on the previous study, which was related to maternal mortality in Gowa district. The minimum sample size was 74 and was divided into two groups for case and control group. We use case to control ratio of 1:4 to detect odds ratio 2.7. The total sample size was 175 (35 cases and 140 controls). Descriptive and analytical statistics were calculated using Statistical Package for Social Sciences version 20.0. Primary data were collected through interviews with a structured questionnaire guidelines. Secondary data obtained through maternal death records, pregnant women cohort registers, medical records and verbal autopsy documents. Data analysis was performed using univariate analysis are described in the form of tables and narrative, to evaluate the large proportion of which are found in the case and control groups of each variable, and to see whether there is any difference between the two groups, we performed bivariate analysis to determine the relative risk estimation, odds ratios (OR) calculated by 2 x 2 tables with formulas as follows:

$$\begin{aligned} \text{(OR)} &= \left\{ \frac{A}{(A+B)} : \frac{B}{(A+B)} \right\} / \left\{ \frac{C}{(C+D)} : \frac{D}{(C+D)} \right\} \\ &= A/B : C/D = AD/BC \end{aligned}$$

2.1. Ethical Clearance

Ethical clearance was obtained from the Ethics Committee of the Medical Faculty, Hasanuddin University, Makassar, South Sulawesi, Indonesia.

3. Results

In this study we examined the health status which consisted of nutritional status, anemia, disease history and previous pregnancy complications (Table 1). Nutritional status in this study is referred to whether a woman had chronic energy deficiency or not. Determination of chronic energy deficiency was based on maternal mid-upper arm circumference in cohort register. The results of this study showed that 62.9% of mothers in the case group were not classified as chronic energy deficiency and 94.3% of mothers in the control group. Then 37.1% of mothers in the case group were classified as chronic energy deficiency and 5.7% of mothers in the control group. Status of anemia was found in 40.0% of women in the case group and 7.9% in the control group. In this study we found non anemic status, 60% in case group and 92.1% in control group. The results of this study found that there were 37.1% and 15.0% of women in the case group and in the control group had a history of previous illness, respectively. Furthermore, There was no previous illness history found in 62.9% of mothers in the case group and 85.0% in control group. Prior history of pregnancy complications found 14.3% of mothers in the case group and 9.3% of mothers in the control group. Then 85.7% of mothers in the case group and 90.7% of mothers in the control group had no prior history of pregnancy complications.

Table 1. Distribution of Maternal Death According to Health Status In Gowa District, South Sulawesi Province 2013

| Health Status | Groups | | | | Total | |
|-----------------------------------|--------|------|---------|------|-------|------|
| | Case | | Control | | n | % |
| | N | % | N | % | | |
| Chronic energy deficient | | | | | | |
| - Yes | 13 | 37,1 | 8 | 5,7 | 21 | 12,0 |
| - No | 22 | 62,9 | 132 | 94,3 | 154 | 88,0 |
| Anemia Status : | | | | | | |
| - Yes | 14 | 40,0 | 11 | 7,9 | 25 | 14,3 |
| - No | 21 | 60,0 | 129 | 92,1 | 150 | 85,7 |
| Disease history : | | | | | | |
| - Yes | 13 | 37,1 | 21 | 15,0 | 34 | 19,4 |
| - No | 22 | 62,9 | 119 | 85,0 | 141 | 80,6 |
| Previous pregnancy complications: | | | | | | |
| - Yes | 5 | 14,3 | 13 | 9,3 | 18 | 10,3 |
| - No | 30 | 85,7 | 127 | 90,7 | 157 | 89,7 |

Source : Primary Data 2013.

Result of statistical analysis shows the value of OR = 9.750, meaning, women with high risk have almost 10 times having maternal death compared to low risk women.

Lower Level(LL) and Upper Level(UL) higher than 1, therefore the high risk of health status is a significant risk factor against maternal mortality (Table 2).

Table 2. Risk Factor of Health Status In Maternal Mortality Pattern In Gowa District 2013

| Health Status | Groups | | | | Total | | CI 95% (LL - UL) |
|---------------|--------|-------|---------|-------|-------|-------|--------------------------------|
| | Case | | Control | | N | % | |
| | N | % | N | % | | | |
| High Risk | 13 | 37,1 | 8 | 5,7 | 21 | 12,0 | OR = 9,750 (3,624 - 26,230) |
| Low Risk | 22 | 62,9 | 132 | 94,3 | 154 | 88 | |
| Total | 35 | 100,0 | 140 | 100,0 | 175 | 100,0 | |

4. Discussion

The health status of the mother is the important element that should become a priority for both mother and other family members. This is important because the condition of mothers who have optimal health status, can prevent unwanted maternal deaths [13,14]. Maternal medical history, experience of pregnancy/childbirth before, whether experienced complications or not, normal parturition or abortion, an important factor that must be considered.

The results of this study showed that 37.1% of women dying due to maternal health status at risk and 94.3% of survivor has a health status that is not at risk. This study found that 12.0% of women suffer from chronic energy deficiency, and anemia, and 19.4% of women who had a history of disease, and 12.0% of women who have complications in previous pregnancy. Then 10.9% of women who have complications in previous delivery.

In previous study in Eritrea, 16% of maternal death occurred during pregnancy, 48% during childbirth, and 36% postpartum. The causes of maternal mortality have been classified as direct and indirect. The main direct causes of maternal deaths are obstetric hemorrhage, puerperal sepsis, pregnancy-induced hypertension, obstructed labor and ruptured uterus, and complication of unsafe abortion [15]. Indirect causes contribute for 20% to 25% of maternal mortality [16], they are include anemia; malaria; HIV/AIDS; diseases of the heart, lung, liver or kidneys; and ectopic pregnancies. Several studies indeed shown that a history of previous illness, such as asthma, hypertension, tuberculosis, malaria, hepatitis and others, have an important role as a risk status for cause of maternal mortality [17,18,19]. Tuberculosis for example, based on the 1986 Survey contributes 8.6% of maternal mortality and based Survey in 1992, the disease contribute to 9.8% of the mortality [18,20]. Pregnancy with tuberculosis is still high, but have a good prognosis if treated early [18]. Other diseases are also found in the history of the disease in pregnancy are malaria, hepatitis, HIV/AIDS, diabetes mellitus, bronchopneumonia. The results of this research, reveal that mothers who have high risk of health status significantly will have 9,750 times the risk of maternal death.

5. Conclusions

In conclusion, this study shows that mothers who have high risk of health status was the most important risk factor measured for all definitions of maternal death.

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