

RISK FACTOR FOR NEAR MISS AND MATERNAL MORTALITY AT TEACHING HOSPITAL MAKASSAR CITY PERIOD OCTOBER 2018-OCTOBER 2019

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ABSTRACT -- Maternal near miss has similar characteristics to the incidence of maternal death. Women who experience maternal near miss events can provide accurate information that describes the situation during pregnancy, childbirth, and postpartum complications. By examining near miss events, information about risk factors and factors that need to be avoided can be identified, so that it does not cause death. This study aims to assess the effect of labor risk factors on near miss and maternal mortality. The methods is hospital-based case control study to assess risk factors for near miss and maternal mortality. Data is taken from all mothers giving birth above 20 weeks of pregnancy who experienced near miss and maternal death in the education network hospital Department of Obstetrics and Gynecology, Faculty of Medicine, Hasanuddin University, Makassar. A total sample of 76 people for inclusion criteria and 76 people as controls, namely mothers giving birth with mild to moderate complications. Controls were selected according to age and hospital for the same inclusion criteria. Data were collected using a questionnaire and analyzed logistic regression with SPSS. The results there were 67 near miss events and 9 maternal deaths from 10 October 2018 to 9 October 2019. Logistic regression analysis found that there was an influence of poor nutritional status ($p < 0.001$), pre-existing disease ($p < 0.001$), preterm gestational age ($p < 0.001$), mode of delivery SSTP ($p < 0.001$), less ANC visit ($p < 0.001$), low level of education ($p < 0.001$), and low socio-economic ($p 0.01$) for near miss and maternal mortality. This study concludes there is a relationship between poor nutritional status, pre-existing disease, preterm gestational age, mode of delivery SSTP, less ANC visit, low level of education, and low socio-economic towards the incidence of near miss and maternal death.

Keywords-- Risk Factors, Near Miss, Maternal Mortality

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I. INTRODUCTION

One of the biggest challenges to health problems in the world is maternal death. Currently, the global maternal mortality ratio reached 251 (221-289) deaths per 100,000 live births (Say *et al*, 2014). Decreasing maternal mortality rate is an attempt of millennium development point five whereas the point emphasized the maternal mortality rate had to go down to 75%. Maternal mortality ratio in Indonesia is 305 deaths per 100,000 live births in the year 2015. The maternal mortality rate is still far from the target of 2015 *Millennium Development Goals* (MDGs) which is 102 deaths per 100,000 live births (Ministry of Health, 2015). Women's reproductive health needs to be considered, in their life cycle, women experience several stages of life including pregnancy and childbirth. The health of pregnant, childbirth, and post-partum woman is a priority health problem, pregnant women need to be healthy in order to deliver healthy babies but maternal health in Indonesia is still far from optimal, this can be seen from the maternal morbidity and mortality rates that are still high.

More than 99% of women who die from pregnancy-related complications reside in low and middle income countries including Indonesia. Therefore, a reliable and comprehensive set of medical and social factors related to maternal mortality is needed from prospective population-based data sets that can also track maternal mortality rates over time. Early identification of risk factors is very important to develop a comprehensive intervention strategy so as to prevent complications related to pregnancy. Maternal mortality rate will not decrease without a comprehensive intervention strategy that includes risk factors monitoring (Cross *et al*, 2010). Maternal near miss event has similar characteristics to the incidence of maternal death. Women who experience maternal near miss events can provide more sensitive and accurate information that describes the condition of the woman during the complications of pregnancy, childbirth, and post-partum. By observing maternal near miss events, information about risk factors can be identified, also factors that need to be avoided even factors that must be corrected related to maternal near miss events. Hence by knowing these factors, action can be taken to reduce maternal mortality rate and long-term consequences arising from maternal morbidity (Jahan *et al*, 2006). Hospital is a final referral facility that is expected to save a woman's life from death due to obstetric complications or to reduce the severity of the outcome that can occur.

The incidence of near miss events in Makassar in the period of January until April 2018 was 26 cases. Meanwhile, the maternal mortality rate in Makassar was 10 cases in 2016 and decreased to 7 cases in 2017 (Profile of the South Sulawesi Health Service, 2018). Based on the data above, researchers are interested in looking deeper into the causes of near miss events and maternal deaths in Makassar. The aim of this study was to determine the risk factors for the incidence of near miss and maternal death from 10 October 2018 until 9 October 2019 at the teaching hospital of Department of Obstetrics and Gynecology, Faculty of Medicine, Hasanuddin University, Makassar.

II. METHODOLOGY

Participants

All mothers with gestational age > 20 weeks who delivered with mild to moderate complications at the hospital education network Department of Obstetrics and Gynecology, Faculty of Medicine, Hasanuddin University, Makassar, who experienced near miss and maternal deaths. The number of samples was 76

respondents, of which 68 experienced near miss and 8 experienced maternal death. While as a number of controls 76 respondents based on matching the characteristics of age and the same hospital to the case.

Experimental Design

Hospital-based case control study to assess risk factors for near miss and maternal mortality. Controls were selected according to age and hospital for the same inclusion criteria.

Experimental Protocol

All mothers in the hospital where the study was conducted were selected according to inclusion criteria. After the mother is given an explanation of this research, the mother is given the opportunity to choose whether or not to take part in this research. If the mother is willing, data collection is done through history taking and in-depth interviews according to the operational definition and proven by the maternal and child health book & medical record. Mothers are followed during labor for up to 42 days after the baby is born and the results of the baby's output are also recorded. After obtaining a total of patients who experienced near miss and maternal death in the specified period, samples were taken for control based on the same age indicator and hospital. Data then entered into the main table and analyzed using SPSS for Windows.

Statistical Methods

Data were collected using a questionnaire and analyzed logistic regression with SPSS for Windows. P-value <0.05 is used as a successful cutoff value.

III. RESULTS

The number of respondents included in study is 76 respondents, of which initially 68 experienced near miss events and 8 experienced maternal death. After observation, the final numbers are 67 near miss events and 9 maternal deaths. While as control, 76 respondents were chosen based on characteristics matching including age and hospital of the case.

In table 1, it can be seen the age of case and control respondents, the vast majority (64.47%) is within the range of 20-35 years. There were 41 (53.95%) referred cases, and 56 (73.68%) self-reported controls.

Table 1. Distribution of Respondent Characteristics in Makassar City Teaching Hospital for the period 10 October 2018 - 9 October 2019

Characteristic	Case (n=76)		Control (n=76)		T-Test
	Frequency	Percentage(%)	Frequency	Percentage(%)	
Age (years)					< 0.001
< 20	7	9.21	7	9.21	
20-35	49	64.47	49	64.47	
>35	20	26.32	20	26.32	
How to come					
Independent	35	46.05	56	73.68	

Referred	41	53.95	20	26.32	
Occupation					< 0.001
Housewives	65	85.53	42	55.26	
Trader	3	3.95	3	3.95	
Entrepreneur	6	7.89	17	22.37	
Government	2	2.63	8	10.53	
Employee	-	-	6	7.89	
Employee					1
Health Insurance	67	88.16	71	93.42	
National Health Insurance (BPJS)	9	11.84	5	6.58	
General					

Source: Primary Data

Most of the respondents in this study, 65 (85.53%) cases and 42 (55.26%) controls were housewives. Based on health insurance used, 67 (88.16%) from case group and 71 (93.42%) from control group were using National Health Insurance (BPJS).

In table 2, can be seen that the main cause of near miss and maternal death is gravidarum eclampsia with 30 cases (39.47%), followed consecutively by severe preeclampsia + HELLP syndrome 9 cases (11.84%), hypovolemic shock + atonic uterine 6 cases (7.90%), hypovolemic shock + uterine rupture 6 cases (7.90%), severe preeclampsia + pulmonary edema 6 cases (6.80%), hypovolemic shock + accrete/increte placenta 5 cases (6.80%), total placenta previa + severe anemia 5 cases (6.80%), puerperal eclampsia 4 cases (5.26%), cardiac arrest due to suspected amniotic embolism 4 cases (5.26%), and hypovolemic shock + placental abruption 2 cases (2.63%).

Table 2. Distribution of Causes of Near Miss and Maternal Death in Makassar City Teaching Hospital for the period of 10 October 2018 - 9 October 2019

Diagnosis	Frequency	Percentage
Severe Preeclampsia + Pulmonary Edema	5	6.58
Severe Preeclampsia + HELLP Syndrome	9	11.84
Eclampsia Gravidarum	30	39.47
Eclampsia Puerperalis	4	5.26
Hypovolemic Shock + Uterine Atony	6	7.90
Hypovolemic Shock + Uterine Rupture	6	7.90
Hypovolemic Shock + Placental Abruption	2	2.63

Hypovolemic Shock + Accrete/Increte Placenta	5	6.58
Total Placenta Praevia + Severe Anemia	5	6.58
Cardiac arrest e.c suspected Amniotic Embolism	4	5.26

Of the 9 cases of maternal mortality in table 2, the highest number was due to suspected amniotic embolism (4 death cases). Other causes of maternal death are due to hypovolemic shock + atonic uterine, puerperal eclampsia, total placenta previa, and 2 cases of gravidarum eclampsia.

Tabel 3. Risk Factors of Delivery at Makassar City Teaching Hospital period 10 October 2018 - 9 October 2019

Risk Factor	Case (n=76)		Control (n=76)		X ² -Test
	Frequency	Percentage(%)	Frequency	Percentage(%)	
Nutritional Status					
Poor	47	61.84	23	30.26	< 0.001
Sufficient	29	38.16	53	69.74	
Pre-Existing Disease					
Present	26	34.21	3	3.94	< 0.001
Absent	50	65.79	73	96.06	
Parity					
Multiparous	49	64.47	46	60.53	0.615
Primiparous	27	35.53	30	39.47	
Gestational Age					
Preterm	47	61.84	10	13.16	< 0.001
Term	29	38.16	66	86.84	
Pregnancy Distance					
High Risk	13	17.10	6	7.89	0.086
No Risk	63	82.90	70	92.11	
Mode of Delivery					
Caesarean Section	60	78.95	26	34.21	< 0.001
Vaginal Delivery	16	21.05	50	65.79	
ANC Visit					
Less	50	65.79	7	9.21	< 0.001
Enough	26	34.21	69	90.79	
Level of Education					
Lower	44	57.89	7	9.21	< 0.001
Higher	32	42.11	69	90.79	
Socio-Economic					

Status	49	64.47	33	43.42	0.009
Low	27	35.53	43	56.58	
High					

Multivariable logistic regression revealed that nutritional status {AOR4.35, 95% CI, 2.14-8.85}, pre-existing disease {AOR12.43, 95% CI, 3.55-43.41}, gestational age {AOR10.47, 95% CI, 4.64- 23.59}, mode of delivery {AOR7.06, 95% CI, 3.40-14.63}, ANC visit {AOR19.53, 95% CI, 7.75-49.18}, level of education {AOR17.30, 95% CI, 6.58-45.50} and socio-economic status {AOR2.77, 95% CI, 1.39-5.51} are factors that are significantly associated with near miss event and maternal mortality.

Women with poor nutritional status have 4 times higher risk of experiencing near miss event and maternal death than sufficient nutritional status. Similarly, women with a history of disease have 12 times higher risk of experiencing near miss event and maternal death comparing with women with no history of disease.

Gestational age is also significant; it is said in table 4 that non-term gestational age has 10 times higher risk than term gestational age. Likewise, cesarean delivery method has 7 times higher risk of experiencing near miss event and maternal death than normal parturition delivery.

Women with less ANC visit have a risk 19 times higher than sufficient ANC frequency. Similarly, women with low level of education have 17 times higher risk of near miss event and maternal death than higher education level. All risk factors are analyzed by univariate and multivariate using logistic regression are summarized in Table 4.

Tabel 4. Analysis of Labor Risk Factors for Near Miss and Maternal Death in Makassar City Teaching Hospital period 10 October 2018 - 9 October 2019

Risk Factor	Case (n=76)	Control (n=76)	COR (95% CI)	AOR (95% CI)	P-value
Nutritional Status					
Poor	47	23	3.73 (1.90-7.32)	4.35 (2.14-8.85)	< 0.001
Sufficient	29	53	1	1	
Pre-Existing					
Disease	26	3	12.65 (3.63-44.07)	12.43 (3.55-43.41)	< 0.001
Present	50	73	1	1	
Absent					
Parity					
Multiparous	49	46	1.18 (0.61-2.28)	0.81 (0.33-1.94)	0.615
Primiparous	27	30	1	1	

Gestational Age

Preterm	47	10	10.69 (4.75-24.05)	10.47 (4.64-23.59)	< 0.001
Term	29	66	1	1	

Pregnancy Distance

High Risk	13	6	2.40 (0.86-6.71)	2.30 (0.82-6.46)	0.093
No Risk	63	70			

Mode of Delivery

Caesarean	60	26	7.21 (3.48-14.92)	7.06 (3.40-14.63)	< 0.001
Section	16	50			
Vaginal Delivery					

ANC Visit

Less	50	7	18.95 (7.62-47.11)	19.53 (7.75-49.18)	< 0.001
Enough	26	69			

Level of Education

Lower	44	7	13.55 (5.50-33.37)	17.30 (6.58-45.50)	< 0.001
Higher	32	69			

Socio-Economic

Status	49	33	2.36 (1.23-4.54)	2.77 (1.39-5.51)	0.010
Low	27	43			
High					

Significant if *p-value* < 0.05, COR (*Crude Odds Ratio*)

AOR (*Adjusted Odds Ratio*) based on Age

IV. DISCUSSION

In this study, matching controls were performed based on the same age and hospital. The majority age range is 20-35 years that experience near miss event and maternal death. The number of case and control respondents aged 20-35 years reached 64.47%. This is in accordance with the demographic conditions of Indonesian population where most are in reproductive age, as well as in South Sulawesi and Makassar City in particular (Indonesian Health Profile, 2018; Central Statistics Agency of South Sulawesi, 2018).

The result of the study found 67 cases of near miss event and 9 maternal deaths, including 41 respondents were being referred. For those who experienced maternal death, 7 of them came in person, apparently having less ANC visits and 4 deaths due to suspected amniotic embolism. There were 2 maternal deaths that came by referral, the patient had a history of severe illness and was referred because she needed to be admitted to

ICU. Whereas from 76 control patients, only 20 patients came by referral. The referral of control patients was due to the absence of operating room facilities at the first level of health facilities.

Of all case samples, the most number of occupational statuses were housewives (85.53%). In the case sample, pregnant women who did not work turned out to have a low level of education. This makes the lack of self-awareness to conduct ANC, lack of awareness of danger signs during pregnancy, and the comprehension when being educated is not optimal. Whereas in the control sample, housewives (55.26%) constituted the highest number of work statuses. But they have a higher level of education, so self-awareness for ANC visit and facing danger signs during pregnancy and childbirth are more prepared.

Based on health insurance, most were patients covered with national insurance (BPJS), which are 88.16% in case group and 93.42% in control group. The total population in South Sulawesi Province alone is estimated at 8,520,000 people in 2015, which occupies the seventh province with the largest population in Indonesia, while the coverage of BPJS membership in South Sulawesi Province is 58.50%. Based on data from National Health Insurance Institution Regional IX, by the end of 2017, the coverage of BPJS membership is 75% (Indonesia Health Profile, 2018).

In table 2, the most common cause of near miss event and maternal death is gravidarum + puerperal eclampsia (44.73%), followed by severe preeclampsia with complications (18.42%). Two cases of maternal death with gravidarum eclampsia and 1 case of maternal death with puerperal eclampsia were obtained. High cases of eclampsia and severe preeclampsia can occur because most of these patients turned out to have lack of ANC visit, history of hypertension, and history of severe preeclampsia in previous pregnancy.

In this study, nutritional status, history of illness, gestational age, mode of delivery, frequency of ANC, level of education, and socio-economic status were significantly related to near miss event and maternal mortality. This can be seen in table 4 after univariate analysis which showed P-values of <0.05.

The results of this study are similar to a study in Sudan by Ali A *et al* in 2011 which stated that there was no relationship between parity and near miss events. Multiparous mother is a risk factor for complicated pregnancy and childbirth (Ali A *et al*, 2011). Parity status can also influence mothers to give birth by cesarean section method. If the mother is multiparous and has a history of cesarean section, it will increase the incidence of near miss event (Cunningham *et al*, 2014).

Women with pre-existing disease have 12 times higher risk of experiencing near miss event and death compared to absent pre-existing disease. Similarly, the method of trans-peritoneal section caesarean delivery has a risk of near miss and maternal death 7 times higher than vaginal delivery method. This finding is in line with the study of Melissa *et al* in 2015. However, in this study the risk was higher than that carried out in Maternal Newborn Health Registry (MNHR) countries such as Kenya, Zambia, India, and Pakistan which were said to be 8 times the risk of near miss and maternal death with a history of illness and 2.4 times the risk of near miss and death with cesarean section operative labor. The higher incidence in this study may have been caused by the lack of awareness of the mother to check herself and treat any accompanying diseases during pregnancy. Even though the history of preexisting disease can affects the pregnancy and worsens the situation at the time of delivery, also influences the reciprocity between the mother and baby, therefore lead to reduction of mother survival (Melissa *et al*, 2015).

Women with a history of pre-existing disease have a higher chance of experiencing near miss events, which is consistent with studies in Brazil and the Netherlands, although other studies have shown that comorbidities are not significantly associated with near miss event. For example, chronic hypertension greatly increases the risk of complications such as severe preeclampsia, placental abruption, retarded fetal growth and premature birth. Chronic hypertension, diabetes mellitus and cardiovascular disease can be indicators for referral to higher health facilities (Mekango *et al*, 2017). In this study most cases of near miss and maternal death have a history of hypertension, hyperthyroidism, heart disease, diabetes mellitus, and obesity.

The method of caesarean delivery in this study was more often done as an emergency measure to save the lives of the mother and the fetus she was carrying. Cases of women who almost died after caesarean section are often associated with risk factors that exist before surgery (Maswime *et al*, 2017). Several studies have reported an increased risk of blood transfusion, hysterectomy, bleeding complications, infection, and death among women who undergo caesarean section. However, assessing the risk of caesarean section compared to vaginal delivery is complicated, because adverse outcomes after caesarean section can be confused by maternal medical conditions that require surgery (Litorp *et al*, 2016). In this study there were 9 cases of maternal death, 6 of them were performed caesarean section and 3 cases were performed vaginal delivery. The caesarean section is the last attempt to save the lives of the mother and the fetus she is carrying. Whereas 3 maternal deaths with vaginal delivery caused suspicion of amniotic emboli that needed rapid treatment and this situation was difficult to be saved.

Women who give birth with preterm gestational age have 10 times higher risk of experiencing near miss event and death compared to those at term gestational age. The results of this study are in line with research conducted by Ewnetu *et al* in Ethiopia in 2018. In a study conducted by Ewnetu it was said that mothers giving birth during preterm gestational age have a risk of near miss 8 times higher than term gestational age. The preterm terminated pregnancy is generally found in women giving birth with related complications such as severe preeclampsia, eclampsia, and placenta previa. Whereas post-term pregnancy can increase complications in the mother itself due to poor fetal conditions (Ewnetu *et al*, 2018).

Women with frequency of ANC less than 4 times has the risk of near misses and mortality 19 times higher than those with $ANC \geq 4$ times. Similarly, a low level of education has a risk 17 times higher than a level of higher education. Whereas women with low socio-economic status have risk 2 times higher to experience near miss event and maternal death than high socio-economic status. The three things above are in line with research conducted by Mulugeta *et al* in 2018. But in the study of Mulugeta *et al*, the increased risk experienced was smaller than this study (Mulugeta, 2018).

Almost all respondents have mother and child health monitoring handbooks (KIA handbooks). This KIA Handbook can also be used as an prove that a pregnant woman has made the first ANC visit. Based on data from the Makassar City Health Office, in 2017 the number of first ANC visit in trimester 1 (K1) was 99%, the number of ANC visits ≤ 4 times according to the standard (K4) in Makassar was 95%, and in South Sulawesi Province in 2016 was 79.81 % (Central Statistics Agency of South Sulawesi, 2018). While the results of this study shows lack of ANC visits during pregnancy (65.79%) in case group, this can occur because of the low level of education so that patients still do not know the importance of ANC during pregnancy. In patients who come from outside the city of Makassar, the long distance to the health facility is one of the factors that pregnant women are

reluctant to attend pregnancy control. From 41 references, only 2 were from Puskesmas Bangkala (Bangkala first level healthcare facility) and Puskesmas Mamajang (Mamajang first level healthcare facility). Other references are referrals from hospitals within and outside the city of Makassar.

According to Chauhan in 2011, the level of education affected the mother in maintaining her health. In general, pregnant women with a higher educational level will usually visit antenatal care services, understand the nutritional intake that is appropriate for their health and the baby they are carrying. Mothers who have a higher level of education will indirectly become more confident and have social status, for example, in contributing ideas about the number of children they want, the choice of place to undergo delivery, and the existence of gender equality between mother and husband. By increasing maternal knowledge about the risk factors for pregnancy and childbirth complications through counseling and antenatal care services, the danger of pregnancy complications can be anticipated. So that if complications in pregnancy and childbirth occur, the mother understands what must be done to cope with the situation (Chauhan, 2011).

Based on Makassar City population data, only 55% of women of reproductive age are employed and the rest are not. In this study, the average case respondent did not work (housewife). As many as 78% of the population in Makassar City are female and above 15 years of age have education >9 years, contrary to the percentage of educational level in this study (Central Statistics Agency of South Sulawesi, 2018).

Based on economic level, income per capita data in South Sulawesi Province by 2018 was 315,738 rupiahs/month, and 8.87% was poor population (Indonesian Health Profile, 2018; Central Statistics Agency of South Sulawesi, 2018). Low economic level will also affect the nutritional needs of mothers during pregnancy, so this study has a significant nutritional deficiency status.

Nutrition issues of the child must be considered since they are still in the womb. The history of the nutritional status of pregnant women is an important factor in fetal growth and development. If there is a lack of nutritional status early in life, it will have an impact on subsequent lives such as Retarded Fetal Growth (RFG), Low Birth Weight (LBW), low immunity and the risk of death (Ministry of Health, 2015).

V. CONCLUSION

Based on the results and discussion of this study, it can be concluded that there were 67 near miss events and 9 maternal deaths during the period of 10 October 2018 until 9 October 2019 at the network hospital of Department of Obstetrics and Gynecology, Faculty of Medicine, Hasanuddin University, Makassar. The risk factors that influence the incidence of near miss event and maternal mortality in this study are poor nutritional status, present of pre-existing disease, preterm gestational age, mode of delivery SSTP, less ANC visit, low level of education, and low socio-economic status. The caesarean section mode of delivery is a risk factor in reducing maternal mortality.

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