ORIGINAL ARTICLE:

Maternal mortality risk factor in pregnancy with heart disease at Dr. Soetomo General Hospital, Surabaya, Indonesia

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ABSTRACT

Objectives: This research want to identify some factors that increasing risk of maternal death in pregnant woman with heart disease.
Materials and Methods: This study was a retrospective analytic study with cross sectional design, with total sampling 92 patient with heart disease in pregnancy at maternity room Dr. Soetomo hospital, Surabaya, during periode January until December 2017.
Results: Prevalency of pregnancy with heart disease in dr. Soetomo hospital about 0,5% with mortality that caused by heart disease 14% from all maternal death. Factors that increase risk of maternal death are non adequate antenatal visit number (OR 1,7;CI 95%), delay of detecting heart disease (OR 2,5;CI 95%), complication such as severe pulmonal hypertension (OR 61,4;CI 95%), Eisenmenger syndrome (OR 2,9;CI 95%), Decompensatio Cordis Functional Class IV (OR 1,2;CI 95%), and Thrombo-embolism (OR 9;CI 95%).
Conclusion: Mortality rate in pregnancy with heart disease is 14% of all maternal mortality. Risk of maternal death increased by non adequate antenatal visit and delay in heart disease detection, and also medical complications. Detection of heart disease since before pregnant with pre-conceptional councelling and a good managed multidisciplinary antenatal care supposed to decrease morbidity and mortality.

Keywords: antenatal care; pre-concepcional councelling; pregnancy; heart disease; maternal mortality.

ABSTRAK

Tujuan: Penelitian ini bertujuan untuk mengetahui faktor yang berperan meningkatkan resiko kematian maternal pada kasus kehamilan dengan penyakit jantung.
Bahan dan Metode: Merupakan studi analitik retrospektif, desain potong lintang, dengan total sampling 92 pasien hamil dengan kelainan jantung di Kamar Bersalin RSUD dr. Soetomo Surabaya periode Januari sampai Desember 2017.
Hasil: Prevalensi kehamilan dengan kelainan jantung di RSU dr. Soetomo 0,5% dari seluruh kunjungan, dengan angka kematian 14% dari seluruh kematian maternal. Faktor yang meningkatkan resiko kematian maternal antara lain jumlah kunjungan antenatal yang kurang memadai (OR 1,7; CI 95%), keterlambatan deteksi kelainan jantung (OR 2,5;CI 95%), adanya penyulit berupa hipertensi pulmonal berat (OR 61,4;CI 95%), sindroma Eisenmenger (OR 2,9;CI 95%), Decompensatio Cordis Class IV (OR 1,2;CI 95%), dan Tromboemboli (OR 9;CI 95%).
Simpulan: Angka kematian akibat kehamilan dengan penyakit jantung 14% dari seluruh kematian maternal. Resiko kematian maternal ditingkatkan dengan jumlah kunjungan antenatal yang kurang memadai dan keterlambatan deteksi kelainan jantung, disamping adanya kondisi-kondisi penyulit. Deteksi penyakit jantung sejak sebelum hamil melalui konseling pra-konsepsi dan pelayanan antenatal yang baik oleh tim multi disiplin, diharapkan menurunkan morbiditas dan mortalitas yang ditimbulkan.

Kata kunci: pemeriksaan antenatal; konseling pra-konsepsi; kehamilan; kelainan jantung; kematian maternal.

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INTRODUCTION

Heart disease is one of the main causes of maternal mortality.[1] The number of pregnant women with heart disease continues to increase, one of them because of the many congenital heart disorders that have been intervened during childhood, so that they can reach childbearing age. In addition, it is also due to the increase in pregnancy rates in women with ischemic heart disease. Pregnancy in women with heart disease is categorized as moderate to high risk. The normal heart can tolerate physiological hemodynamic changes that occur during pregnancy such as decreased vascular resistance, increased blood volume, increased heart rate and cardiac output. Whereas in women with impaired heart function, all these physiological changes will increase the heart burden and can result in maternal and perinatal complications during pregnancy and association.[2–4] The prevalence of pregnancy in women with heart disease varies in each country, between 0.9 to 3.7 percent.[3] Types of congenital heart disease pre-dominate in developed countries and rheumatic heart disease still dominates in developing countries.[4]

In heart disease that has been previously known, pregnancy can be prepared with pre-conception counseling and a good ante natal examination. Counseling contains comprehensive information about possible risks to the mother and baby during pregnancy and childbirth, such as worsening maternal hemodynamic conditions, the risk of postpartum bleeding, the risk of death, the possibility of abortion, IUGR, preterm birth, to the choice of postpartum contraception. An antenatal examination should be able to explore a history of previous heart disease, a history of cardiovascular disease, a thorough physical examination, laboratory support examinations, and electrocardiography examination, chest photographs, to echocardiography if needed.[7]

Although the incidence of pregnancy with heart disease is a small number, this heart disease is a significant indirect cause of maternal mortality (9.5%). Maternal mortality can actually be prevented by quality antenatal examination, identification of high-risk patients, identification of complications that may arise, such as postpartum autotransfusion which results in cardiac decompensation and results in death.[8]

MATERIALS AND METHODS

This study was a retrospective analytic study with cross sectional design. The study was conducted in the Maternity Room of the dr. Soetomo hospital, Surabaya in January-December 2017.

Table 1. Characteristics of pregnant women with heart disease (January - December 2017)

Variables	n (%)	Median
Age (years)		26
< 17 years	0 (0)	
17-35 years	72 (78.2)	
> 35 years	20 (0.22)	
Parity status		
I	41 (44.6)	
II	26 (28.3)	
III	15 (16.3)	
IV	10 (10.9)	
Patient's origin		
Inside the town	29 (31.5)	
Out of town	63 (68.4)	
BMI		
Underweight	2 (2.2)	
Normal	73 (79.3)	
Obesity	17 (18.5)	
Heart abnormality		
Congenital	38 (41.3)	
Rheumatic	41 (44.6)	
Functional	13 (14.1)	
Heart abnormality detection		
Before pregnancy	28 (30.4)	
During pregnancy	62 (67.4)	
Post Partum	2 (2.2)	
Congenital abnormalities		
ASD	19 (50)	
VSD	9 (23.7)	
PDA	3 (7.9)	
ToF	7 (18.4)	
Site of ANC		
Health center/Midwifery	10 (10.8)	
Hospital	79 (85.9)	
Never ANC	3 (3.3)	
Number of ANC		
< WHO recommendation 2016 (by pregnancy age)	27 (29.3)	
> WHO recommendation 2016 (by pregnancy age)	65(70.6)	
Mode of Delivery		
Pervaginam	35 (38)	
Perabdominam	57 (62)	
Time of termination		
<34 mgg	32 (34.8)	
34-37 mgg	26 (28.3)	
>37 mgg	32 (34.8)	
Contraception		
IUD	45 (49)	
Sterile	43 (46.7)	
No contraception	4 (4.3)	
History of intervention		
PTMC	2 (2.2)	
ASD closure	1 (1.1)	
Infant bodyweight		
<1000 g	11 (12.2)	
1000-2000 g	22 (24.4)	
2000-3000 g	44 (48.8)	
>3000 g	13 (14.4)	
Infant's Apgar Score		
IUFD (0)	3 (P3.3)	
<4	35 (38.9)	
4-6	20 (22.2)	
>6	32 (35.6)	
IUGR (Lubschenco score p<10)	15 (16.7)	

Data was obtained secondary from medical records. The sample selection was done by the total sampling method, where the data in accordance with the inclusion criteria are all patient data with heart disease that have

been established by fellow cardiologists included in the analysis of the research data. Data collected included age, parity status, type of heart disease, time of heart disese detected, number of antenatal visits, antenatal care, methods of delivery, contraceptive methods, maternal outcomes and infant outcomes. The ethical feasibility of this research was obtained from the Health Research Ethics Committee of Dr. Soetomo Hospital, Surabaya No. 0066/KEPK/II/2018.

RESULTS AND DISCUSSION

There were 92 pregnant patients with heart abnormalities during the period January - December 2017, which consisted of rheumatic heart disesae, congenital heart disease, and functional heart disesae.

The characteristics of pregnancy patients with the heart disesae studied were described in Table 1. Most pregnant patients with cardiac abnormalities were young women with a median of 26 years.After the patient was referred to RSUD dr. Soetomo, made a diagnosis with anamnesa and physical examination, followed by laboratory investigations, electrocardiography, and echocardiography. Joint treatment was carried out by a multidisciplinary team consisting of Obsession, Cardiology, Anesthesia and other related fields.

Of the 92 cases of pregnancy with heart diseae, 10 maternal mortality with the underlying disease of Atrial Septal Defect (ASD) were 5 patients (50%), 2 patients of Mitral Stenosis (20%), Old Myocard Infarc (CHD OMI) Coronary Heart Disease was 1 patient , Peripartum cardiomyopathy (PPCM) was 1 patient (10%), and suspected 1 patient of embolism (10%). The underlying disease was complicated by severe Pulmonary Hypertension, Decompensation Cordis Functional Class (DCFC) IV, Peripartum cardiomyopaty (PPCM), and thromboembolic suspicion. All mortalities occur in the postpartum period. The characteristics of maternal mortality were described in Table 2. Factors that influenced maternal mortality in pregnancy with heart disese were illustrated in Table 3.

In this study, there were 92 cases of pregnancy with heart disease which constituted 0.5% of all pregnant patients in the Maternity Room of Dr. Soetomo General Hospital Surabaya during 2017. The highest age group of pregnant patients with heart disease was 17-35 years (78%), with a median of 26 years. Most parital status was 41 primigravida patients (44.6%). This was consistent with previous research, that pregnancy with heart disease was commonly increase in young women, especially with congenital heart disease.

Tabel 2. Characteristics of Maternal Mortality in Pregnancy with Heart Disease (Januari-Desember 2017).

Variables	n (%)	Median
Age (years)		29
< 17 years	0 (0)	
17-35 years	7 (70)	
> 35 years	3 (30)	
Parity status		
I	4 (40)	
II	5 (50)	
III	1 (10)	
Patient's origin		
Inside the town	2 (20)	
Out of town	8 (80)	
Heart abnormality		
ASD	5 (50)	
Severe MS	2 (40)	
OMI CHD	1 (10)	
PPCM	1 (10)	
Pulmonary emboli	1 (10)	
ANC		
< WHO recommendation by pregnancy age	4 (40)	
> WHO recommendation by pregnancy age	6 (60)	
Site of heart disease detected		
Midwifery/health center	0 (0)	
Referring hospital	9 (90)	
dr Soetomo Hospoital	1 (10)	
Heart abnormality detection		
Before pregnancy	1 (10)	
During pregnancy	9 (90)	
Mode of Delivery		
Pervaginam	1 (10)	
Perabdominam	8 (80)	
Not terminated	1 (10)	
complications		
Severe PHT	7 (70)	
DCFC IV	1 (10)	
Eisenmenger syndr.	1 (10)	
PPCM	1 (10)	
Time of death		
<24 h post partum	7 (70)	
1-3 days post partum	2 (20)	
>3 hr post partum	1 (10)	

This was caused by advances in medical technology, so that women with congenital heart disorders had received management and surgical intervention in childhood, so that they can reach reproductive age and pregnancy. But despite interventions, there was often a residual defect that will cause hemodynamic disorders during pregnancy.[8] In this study there were 2 patients with a history of Percutaneus Transvenous Mitral Comissurotomy (PTMC) surgery, and 1 patient with a surgical history of ASD closure.

The most common type of heart disease is rheumatic heart disease, 41 patients (44.6%), followed with 38 patients of congenital heart disease (41.3%). The most common congenital abnormalities are Atrial Septal Defect (ASD), followed with Ventrikular Septal Defect

(VSD), Patent Ductus Arteriosus (PDA), and Tetralogy of Fallot (ToF). This was consistent with previous studies that rheumatic heart disease dominates in developing countries, whereas in developed countries more dominant with congenital heart disease. Valve abnormalities in rheumatic heart disease, which are often associated with poor maternal outcomes are Mitral Stenosis. Abnormalities in some valves also have a worse prognosis when compared to abnormalities in just one valve.[9]

Table 3. Factors related to maternal mortality in pregnancy with heart disease

Risk factors	Died N: 10 n (%)	Survive N: 82 n (%)	OR (95%CI)	p-value#
Severe PHT	7 (70%)	3(3.7%)	61.4 (10.3-363.4)	0.01*
Eisenmenger syndrome	1(10%)	3(3.7%)	2.9 (0.2-31.1)	0.37
DCFC IV	1(10%)	7(8.5%)	1.2 (0.1-10.8)	0.87
PPCM	1 (10%)	9(10.9%)	0.9 (0.1-7.9)	0.92
Pulmonary Emboli	1(10%)	1(1.2%)	9.0 (0.5-156.5)	0.13
ANC Number < WHO recommendation by pregnancy age	4(40%)	23(18.3%)	1.7 (0.44-6.2)	0.47
Heart disease detected lately	9 (90%)	64(78%)	2.5 (0.3-21.3)	0.43

A total of 79 patients (85.9%) received antenatal care in hospitals by obstetricians, with 10 patients (10.8%) in the Primary Health Care or Midwives Practice. There were 3 patients who had never done an antenatal examination at all. It is not in accordance with the recommendations of European Society of Cardiology (ESC) that all pregnancies with heart disease should receive antenatal care in hospitals, with maternal risk-based group. Level 1 describes services for complex and high-risk cases (WHO class III or IV) in the form of special and multi-disciplinary special care, with evaluation of heart conditions every month. Level 2 is a service for cases of moderate complexity and mild-moderate maternal risk (WHO class II). At this level the service can be provided in collaboration with specialist doctors with regional cardiologists, and cardiac examinations are carried out every trimester. Whereas for patients with mild heart disease and low risk (WHO class I) grouped in level 3 services, adequate antenatal care in regional hospitals, and evaluation of heart conditions is carried out 1-2 times during pregnancy.[10]

Labor performed at term gestational age (> 37 mgg) was 32 patients (34.8%), and 58 patients (63.1%) had preterm labor, either due to spontaneous labor, or labor induction. This is consistent with previous studies that pregnancies with heart disease can be allowed to naturally labor, but are often chosen to induce labor, especially for maternal saving in conditions of heart failure, and in conditions of adjustment for anticoagulant therapy in valve abnormalities.[10]

Heart disease was mostly detected during the 2nd and 3rd trimester of pregnancy were 62 patients (67.4%). And 28 patients (30.4%) had been detected suffering from heart disease since before pregnancy, especially those with congenital abnormalities. And 2 patients (2.2%) just detected suffering from heart disease during postpartum. This is not in accordance with previous research, that heart disease should have been identified since before pregnancy to reduce the morbidity and mortality. In pre-conception counseling, a history of heart disease is performed, a thorough physical examination, possible hemodynamic disorders during pregnancy and childbirth, the possibility of using a teratogenic drug, and the choice of contraceptive methods.[2]

Most abdominal labor method was 57 cases (62%), both for indications of heart disease and obstetric indications. While vaginal delivery was 35 cases (38%). This is in accordance with previous studies that SC delivery is more common in pregnancies with heart disease than in uncomplicated pregnant women. Although actual vaginal delivery is more of a choice, and SC is preferred for obstetric reasons, because SC is also associated with a greater risk of bleeding, the risk of infection and thromboembolism.[11,12] Conditions that require primary SC include Marfan syndrome and patients while still receiving anticoagulant treatment. The method of SC delivery is chosen because it increases the risk of intracranial bleeding in infants, and acute heart failure in mothers.[13] If vaginal delivery is chosen, it must be evaluated whether the patient is allowed to push or must be with the help of labor instrument. If vaginal delivery is chosen with the help of labor instrument, it must be considered between avoidance of changes in hemodynamics at straining with an increased risk of perineal trauma, bleeding, and head trauma due to the vacuum and forceps.[14]

Babies outcome from pregnancies with heart disease was 3 cases of IUFD. The baby weight <1000 g was 11 babies (12.2%), 1000-2000 g was 22 babies (24.4%), 2000-3000 g was 44 infants (48.8%), and > 3000 g was as 13 baby (14.4%). Based on evaluation with Lubschenco score, 15 infants with IUGR conditions were obtained. Whereas based on the first minute Apgar Score (AS), there were 35 babies (38.9%) with US less than 4 (Severe Asphyxia), 20 babies (22.2%) with AS 4-6 (Moderate Asphyxia), and 32 babies (35.5%) with

AS> 6 (Mild Asphyxia). This is consistent with previous studies that neonatal complications in pregnancies with heart disease were significantly higher than without complications (34% versus 15%). Preterm labor occurs in 13% of pregnancies, of which 67% are iatrogenic. IUGR rates are around 25% with perinatal mortality rates of 20 per 1,000.[15]

The maternal outcome found 10 maternal deaths (14%). The underlying Heart disease was 5 patients with ASD, Mitral severe stenosis was 1 patient, 1 patient with coronary heart disease, Peripartum Cardiomyopathy was 1 patient, and 1 patient with suspected pulmonary embolism. Postpartum mortality occured consist of 7 patients died <24 hours postpartum, 2 patients died 1-3 days postpartum, and 1 patient died> 3 days after delivery. This is consistent with previous research that the peripartum period is a high risk period to watch out for, because during and after labor the heart rate was increases due to uterine contractions, anxiety, pain, straining, bleeding and post partum autotransfusion. Postpartum hemodynamic changes occur due to decompression of vena cava, and increase in blood volume through autotransfusion from uterine contrac-tions.[10,16]

At 10 maternal mortalities, 7 patients were accompanied by severe Pulmonary Hypertension, 1 patient with Decompensatio Cordis Functional Class (DCFC) IV, 1 patient with Eisenmenger syndrome, and 1 patient with PPCM. From an analysis of factors that might play a role in maternal mortality in pregnancies with heart disease, patients with Pulmonary Hypertension have a greater risk of death of 61.4 than those without Pulmonary Hypertension. Pulmonary hypertension is a condition where there is an increase in mean pulmonary artery pressure (MPAP). Mild Pulmonary Hypertension if MPAP is 25-45 mmHg, moderate Pulmonary Hypertension if MPAP is 46-64 mmHg, and Pulmonary Hypertension is severe if MPAP> 65 mmHg. From previous studies 50% of patients with severe pulmonary hypertension will end up in death. Administration of pulmonary vasodilator such as inhalation or intravenous Prostacyclin had been improved, but mortality still reaches 33%. Mortality often occurs several days after labor, and occurs because a combination of increased systemic vascular resistance, decreases cardiac output, distal pulmonary vascular thrombosis and increased backflow from autotransfusion process during contractions and from the placenta.[18]

Patients with Eisenmenger syndrome has mortality risk that increased 2.9-fold. Eisenmenger syndrome is a condition with shunting with flow from right to left, so that the left ventricle pumps blood with low oxygen levels throughout the body. From previous studies, it was found that the mortality rate of pregnant patients with Eisenmenger syndrome was 60%.[17]

In patients with DCFC IV had mortality risk that increased 1.2-fold. Based on the NYHA classification, DCFC IV is condition of heart decompensation characterized by the inability to carry out all physical activities. When resting symptoms of cardiac insufficiency have arisen. From previous studies heart decompensation was induced by several factors including conditions of heart failure or ischemic heart attack before pregnancy, arrhythmias before pregnancy, cyanosis, left heart obstruction and myocardial dysfunction.[6,8]

Patients with thromboembolism has 9-fold risk of death. In pregnancy, due to changes in hemodynamics and fat metabolism, it increases the risk of thromboembolism. In certain conditions such as pregnancy with diabetes, hypertension, dyslipidemia, obesity, heart disease, the risk of thromboembolism increases. Previous research has suggested that the risk of thromboembolism in pregnant women with heart disorders increases 6-fold.

Indonesia were using the integrated ANC system with 4 visits during pregnancy, namely 1 time in first trimester, 1 time in second trimester, and 2 times in third trimester. To achieve a more optimal pregnancy outcome, WHO in 2016 issued recommendations on antenatal care. The recommended number of ANCs is 8 visits. The first visit was carried out until 12 weeks of gestation, then continued at 20, 26, 30, 34.36, 38 and 40 weeks gestation. Recommended ante natal visits are not only in quantity, but also quality with early detection efforts, monitoring maternal and infant health status, and providing interventions according to existing problems. This recommendation replaces recommend-ations about previous ANC, namely FANC (Focused Ante Christmas Care). Comparison of 2016 FANC and recommendation models as in table 4.

From this study the number of inadequate antenatal visits (less than 8 visits at term pregnancy) according to WHO 2016 recommendations, increased the risk of maternal death by 1.7 times.[19]

The delay to detecting a heart disease, where a new heart disease is discovered after pregnancy increases the mortality risk of 2.5-fold compared to when a heart disease is detected before pregnancy. This is consistent with previous research that the risk of pregnancy should have been diagnosed before pregnancy so that management during pregnancy and childbirth can be prepared.[10,15] Proper management of pregnancy includes the involvement of a multidisciplinary team that guarantees good and integrated services during

pregnancy and peripartum. Complications of pregnancy with heart disease can arise with fetal development. Therefore efforts are needed to prevent, recognize, and deal with complications so that the mother can pass the pregnancy and childbirth safely.

Table 4. Comparison of FANC and WHO 2016

WHO FANC model	2016 WHO ANC model
First trimester	
Visit 1: 8–12 weeks	Contact 1: up to 12 weeks
Second trimester	
Visit 2: 24–26 weeks	Contact 2: 20 weeks Contact 3: 26 weeks
Third trimester	
Visit 3: 32 weeks Visit 4: 36–38 weeks	Contact 4: 30 weeks Contact 5: 34 weeks Contact 6: 36 weeks Contact 7: 38 weeks Contact 8: 40 weeks
Return for delivery at 41 weeks if not given birth.	

CONCLUSION

In this study, it was concluded that the prevalence of pregnancy with heart disease at RSU Dr. Soetomo General Hospital was 0.5%, with maternal mortality was 14% of all maternal deaths. The characteristics of pregnant patients with heart disease are mostly young and primigravid. With the most types of abnormalities is rheumatic heart disease. Pregnancy with heart disease results in high morbidity and mortality for the mother, and in infants it causes prematurity, IUFD and asphyxia.

In this analysis study of risk factors that might be related to maternal mortality was carried out. Inadequate number of antenatal visits (according to WHO 2016 recommendations), late detection of heart disease with complication of decompensation cordis class IV, Eisenmenger syndrome, severe pulmonary hypertension and thromboembolism increased the risk of maternal mortality in the population. However, the p value <0.05 was only for severe pulmonary hypertension. Therefore, pulmonary hypertension was significant for the general population.

ACKNOWLEDGMENT

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