

# Cardiac Disease in Pregnancy Maternal and Perinatal Outcomes in RSUP Dr. Mohammad Hoesin Palembang

*by Abarham Martadiansyah*

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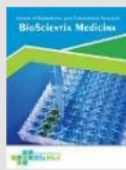
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## **Cardiac Disease in Pregnancy: Maternal and Perinatal Outcomes in RSUP Dr. Mohammad Hoesin Palembang**

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### **ABSTRACT**

**Background:** Impaired maternal and uteroplacental perfusion can occur in pregnancy with cardiac disease leading to maternal and perinatal mortality and morbidity due to increased cardiac load and ventricular dysfunction. This research aims to determine maternal and perinatal outcomes of pregnancies with cardiac disease. **Methods:** This research was a descriptive observational study conducted by total sampling method and cross-sectional design. This research used medical records of pregnant women with cardiac disease who gave birth in RSUP Dr. Mohammad Hoesin Palembang in January 2018-December 2020 as study samples. **Results:** Among 68 pregnancies with cardiac disease, there were 6 cases (0.87%) found in 2018, 38 cases (2.47%) found in 2019, and 24 cases (1.48%) found in 2020. The highest distribution of pregnancies with cardiac disease was found at 64.7% in the range of 20-35 years old age group; 57.4% in the multiparity group; 38.2% in the range of  $\geq 34$  -  $< 37$  weeks gestational age group; 86.8% in the high school educational level group; 66.2% in the high-risk cardiac functional status group; 54.4% in the peripartum cardiomyopathy group; and 36.8% with preeclampsia/eclampsia as a comorbid. In this study, maternal outcomes found were maternal mortality at 11.8%; cardiac failure at 70.6%; arrhythmia at 1.5%; and stroke at 1.5%, while perinatal outcomes found were prematurity at 60.3%; low birth weight at 64.4%; IUGR at 37.0%; IUFD at 1.4%; stillbirth at 6.8%; neonatal death at 9.6%; and perinatal asphyxia at 42.5%. **Conclusion:** The prevalence rate of pregnancies with cardiac disease in RSUP Dr. Mohammad Hoesin Palembang was 0.87% in 2018, 2.47% in 2019, and 1.48% in 2020. The most common maternal outcome in this study was cardiac failure, with most in the peripartum cardiomyopathy group, while the most common perinatal outcome was low birth weight, with most in the hypertensive heart disease group.

### **1. Introduction**

Cardiac disease is the leading nonobstetric cause and generally the third most common cause of maternal mortality.<sup>1</sup> The incidence of pregnancies with cardiac disease was in the range of 0.4-4.1% worldwide.<sup>2</sup> In England, cardiac disease became the second most common cause of maternal mortality. Ditjen Kesehatan Masyarakat Kemenkes RI stated that cardiovascular disease was the fourth most common cause of maternal mortality at 200 cases as of 27 March 2020 (4.74%).<sup>3</sup> Moreover, cardiac disease in pregnancy also increases the risk of serious maternal morbidities,

such as arrhythmia, cardiac failure, and stroke.<sup>4</sup> Data from Riskesdas Sumatera Selatan in 2018 showed that anginal pain/cardiac palpitation was found at 1.24% of all pregnancies.<sup>5</sup> There were 24 pregnancies with cardiac disease (0.58%) found in RSUP Dr. Mohammad Hoesin Palembang in 2016-2019, with hypertensive heart disease as the most common type (33.3%).<sup>6</sup>

Perinatal morbidity and mortality can also occur in pregnancy with cardiac disease due to prematurity and fetal growth restriction. Several previous studies reported that cardiac failure in pregnancy became a

predisposing factor of prematurity, fetal growth restriction, and perinatal asphyxia.<sup>7</sup> Based on previous research in RSUD Arifin Achmad Riau, prematurity (21.2%) and low birth weight (15.2%) were the two primary perinatal outcomes found.<sup>8</sup> Both can induce perinatal anemia. Cardiac disease in pregnancy is also one of the factors causing congenital heart defect in neonates. Most congenital cardiac defects were found in neonates born to women with congenital heart disease.<sup>9</sup>

Cardiac functional status is one of the maternal and perinatal complication predictors of pregnancy with cardiac disease.<sup>4</sup> Research in RSUP Dr. Kariadi Semarang reported that among 59 pregnancies with cardiac disease, there were 57.6% cases with high-risk cardiac functional status and 42.4% cases with low-risk cardiac functional status. Most maternal mortalities in this research were found in pregnant women with high-risk cardiac functional status.<sup>2</sup>

The number of complications caused by cardiac disease in pregnancy and the unavailability of research related to maternal and perinatal outcomes of pregnancies with cardiac disease in RSUP Dr. Mohammad Hoesin Palembang were the reasons for conducting this research. This research aims to determine maternal and perinatal outcomes of pregnancies with cardiac disease in RSUP Dr. Mohammad Hoesin Palembang in 2018-2020.

## 2. Methods

This research was a descriptive observational study conducted by total sampling method and cross-sectional study design. The samples of this research were taken from medical records of pregnant women with cardiac disease who gave birth in RSUP Dr. Mohammad Hoesin Palembang in January 2018 - December 2020 meeting the research criteria. This research was conducted in September 2021 - November 2021, located in RSUP Dr. Mohammad Hoesin Palembang.

Secondary data obtained from medical records were categorized based on research variables, processed using the Statistical Package for the Social Sciences (SPSS) and Microsoft Office Excel programs, and presented in descriptive distribution tables.

## 3. Results

There were 77 pregnancies with cardiac disease in RSUP Dr. Mohammad Hoesin Palembang in the 2018 - 2020 period. However, only 68 cases had complete data and gave birth in the Obstetrics and Gynecology Department of RSUP Dr. Mohammad Hoesin Palembang in 2018 - 2020, while 9 other cases did not give birth in RSUP Dr. Mohammad Hoesin Palembang and did not have complete data.

Table 1. The prevalence of pregnancies with cardiac disease

Year	Number of Pregnancies with Cardiac Disease	Number of Deliveries	Case Prevalence of Pregnancies with Cardiac Disease
	n	n	%
2018	6	686	0.87
2019	38	1537	2.47
2020	24	1623	1.48

Among 68 cases, the highest prevalence rate was found in 2019 at 38 cases (2.47%), the rest were in

2020 at 24 cases (1.48%), and in 2018 at 6 cases (0.87%), as shown in Table 1.

Table 2. The sociodemographic characteristics of pregnant women with cardiac disease

<b>Maternal Characteristics</b>	<b>n</b>	<b>%</b>
<b>Maternal Age</b>		
<20 years old	7	10.3
20-35 years old	44	64.7
≥35 years old	17	25.0
<b>Parity</b>		
Primiparity	24	35.3
Multiparity	39	57.4
Grandmultiparity	5	7.4
<b>Gestational Age</b>		
<28 weeks	3	4.4
≥28 – <34 weeks	14	20.6
≥34 – <37 weeks	26	38.2
≥37 – <42 weeks	24	35.3
≥42 weeks	1	1.5
<b>Educational Level</b>		
Primary or Lower Education	0	0,0
Middle School Education	6	8.8
High School Education	59	86.8
University Education	3	4.4

Based on table 2, the highest distribution of pregnancies with cardiac disease was found at 44 cases (64.7%) in the range of 20 – 35 years old age group, 39 cases (57.4%) in the multiparity group, 26 cases

(38.2%) in the range of ≥34 – <37 weeks gestational age group, and 59 cases (86.8%) in the high school educational level group.

Table 3. The distribution of pregnancies with cardiac disease based on echocardiographic results

<b>Cardiac Disease</b>	<b>n</b>	<b>%</b>
<b>Peripartum Cardiomyopathy</b>	<b>37</b>	<b>54,4</b>
<b>Ischemic Heart Disease</b>	<b>6</b>	<b>8,8</b>
<b>Valvular Heart Disease</b>	<b>11</b>	<b>16,2</b>
Rheumatic Heart Disease	5	7,4
Mitral Stenosis	1	1,5
Mitral Regurgitation	4	5,9
Multiple Valvular Disease	1	1,5
<b>Congenital Heart Disease</b>	<b>7</b>	<b>10,3</b>
Atrial Septal Defect	3	4,4
Ventricular Septal Defect	1	1,5
Atrioventricular Septal Defect	1	1,5
Persistent Ductus Arteriosus	2	2,9
<b>Hypertensive Heart Disease</b>	<b>7</b>	<b>10,3</b>

Table 3 shows that the highest distribution of echocardiographic results in pregnancies with cardiac

disease was peripartum cardiomyopathy, which was at 37 cases (54.4%).

Table 4. The distribution of pregnancies with cardiac disease based on cardiac functional status

<b>Cardiac Functional Status</b>	<b>n</b>	<b>%</b>
Low Risk Cardiac Functional Status	23	33,8
High Risk Cardiac Functional Status	45	66,2

In this research, the distribution of pregnancies with cardiac disease was more commonly found in pregnancies with high-risk cardiac functional status at

45 cases (66.2%) than 23 pregnancies with low-risk cardiac functional status (33.8%) shown in table 4.

Table 5. The distribution of comorbidities in pregnancies with cardiac disease

<b>Comorbidity</b>	<b>n</b>	<b>%</b>
<b>Without Comorbidity</b>	<b>35</b>	<b>51,5</b>
<b>With Comorbidity</b>	<b>33</b>	<b>48,5</b>
Chronic Hypertension	6	8,8
Gestational Hypertension	0	0,0
Preeclampsia/Eclampsia	25	36,8
Diabetes Mellitus	0	0,0
Respiratory Disease	7	10,3
Renal Disease	1	1,5
Thyroid Disease	1	1,5
Systemic Lupus Erythematosus	1	1,5
Anemia	4	5,9
HIV/AIDS	0	0,0

Based on table 5, preeclampsia/eclampsia was the most common comorbidity found in pregnancies with

cardiac disease in this research, which was at 25 cases (36.8%).

Table 6. The distribution of pregnancies with cardiac disease based on maternal outcomes

<b>Maternal Outcome</b>	<b>n</b>	<b>%</b>
<b>Without Poor Maternal Outcome</b>	<b>20</b>	<b>29,4</b>
<b>With Poor Maternal Outcome</b>	<b>48</b>	<b>70,6</b>
Maternal Mortality	8	11,8
Cardiac Failure	48	70,6
Arrhythmia	1	1,5
Stroke	1	1,5

Table 6 shows the distribution of perinatal outcomes in pregnancies with cardiac disease. Among 68 pregnant women studied, cardiac failure at 48 cases

(70.6%) was the most common maternal outcome found.

Table 7. The distribution of neonates based on perinatal outcomes

<b>Perinatal Outcome</b>	<b>n</b>	<b>%</b>
<b>Without Poor Perinatal Outcome</b>	<b>10</b>	<b>13,7</b>
<b>With Poor Perinatal Outcome</b>	<b>63</b>	<b>86,3</b>
Prematurity	44	60,3
Low Birth Weight (LBW)	47	64,4
Intrauterine Growth Restriction (IUGR)	27	37,0
Intrauterine Fetal Death (IUFD)	1	1,4
Stillbirth	5	6,8
Neonatal Death	7	9,6
Perinatal Asphyxia	31	42,5
Perinatal Anemia	0	0,0
Congenital Cardiac Defect (CHD)	0	0,0

Table 7 shows that among 73 neonates studied, Low Birth Weight at 47 cases (64.4%) was the most common perinatal outcome found.

Table 8. The distribution of maternal outcomes based on echocardiographic results

<b>Cardiac Disease</b>	<b>Maternal Mortality</b>	<b>Cardiac Failure</b>	<b>Arrhythmia</b>	<b>Stroke</b>	<b>Total (n)</b>
	<b>(%)</b>	<b>(%)</b>	<b>(%)</b>	<b>(%)</b>	
Peripartum Cardiomyopathy	16,2	91,9	0,0	0,0	37
Ischemic Heart Disease	0,0	50,0	16,7	0,0	6
Valvular Heart Disease	0,0	36,4	0,0	0,0	11
Congenital Heart Disease	0,0	14,3	0,0	0,0	7
Hypertensive Heart Disease	28,6	85,7	0,0	14,3	7

Table 8 shows that the highest percentage of maternal mortality (28.6%) and stroke (14.3%) was found in pregnancies with hypertensive heart disease, the highest percentage of heart failure (91.9%) was found in pregnancies with peripartum cardiomyopathy, and the highest percentage of arrhythmia (16.7%) was found in pregnancies with ischemic heart disease.

Table 9. The distribution of maternal outcomes based on cardiac functional status

Cardiac Functional Status	Mortalitas Maternal	Cardiac Failure	Arrhythmia	Stroke	Total (n)
	(%)	(%)	(%)	(%)	
Low Risk Cardiac Functional Status	0,0	13,0	0,0	0,0	23
High Risk Cardiac Functional Status	17,8	100,0	2,2	2,2	45

Based on table 9, in general, poor maternal outcomes were commonly found in pregnancies with high-risk cardiac functional status compared to low-risk cardiac functional status,

included maternal mortality (17.8%), cardiac failure (100.0%), arrhythmia (2.2%), and stroke (2.2%).

Table 10. The distribution of perinatal outcomes based on echocardiographic results

Cardiac Disease	Prematurity	LBW	IUGR	IUFD	Stillbirth	Neonatal Death	Perinatal Asphyxia	Perinatal Anemia	CHD	Total (n)
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
Peripartum Cardiomyopathy	61.0	70.7	46.3	0.0	9.8	14.6	51.2	0.0	0.0	41
Ischemic Heart Disease	83.3	50.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	6
Valvular Heart Disease	58.3	41.7	25.0	0.0	0.0	0.0	33.3	0.0	0.0	12
Congenital Heart Disease	28.6	57.1	42.9	0.0	14.3	0.0	42.9	0,0	0.0	7
Hypertensive Heart Disease	71.4	85.7	14.3	14.3	0.0	14.3	42.9	0.0	0.0	7

Based on table 10, the highest percentage of prematurity (71.4%), LBW (85.7%), and IUFD (14.3%) were found in neonates born to women with hypertensive heart disease, the highest percentage of IUGR (46.3%), neonatal death

(14.6%), and perinatal asphyxia (51.2%) were found in neonates born to women with peripartum cardiomyopathy, and the highest percentage of stillbirth was found in neonates born to women with congenital heart disease.

Table 11. The distribution of perinatal outcomes based on cardiac functional status

Cardiac Functional Status	Prematurity	LBW	IUGR	IUFD	Stillbirth	Neonatal Death	Perinatal Asphyxia	Perinatal Anemia	CHD	Total (n)
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
Low Risk Cardiac Functional Status	52.2	30.4	8.7	0.0	4.3	0.0	26.1	0.0	0.0	23
High Risk Cardiac Functional Status	64.0	80.0	52.0	2.0	8.0	14.0	50.0	0.0	0.0	50

Based on table 11, poor perinatal outcomes were commonly found in neonates born to pregnant mothers with high-risk cardiac functional status compared to low-risk cardiac functional status in general, included prematurity (64.0%), LBW (80.0%), IUGR (52.0%), IUFD (2.0%), stillbirth (8.0%), neonatal death (14.0%) and perinatal asphyxia (50.0%).

#### 4. Discussion

##### The prevalence of pregnancies with cardiac disease

In this research, there were 77 pregnancies with cardiac disease in the Medical Record Installation of RSUP Dr. Mohammad Hoesin Palembang in 2018-2020. However, only 68 samples met the research criteria out of all these cases. The highest prevalence was found at 2.47% in 2019, the rest 1.48% were found in 2020, and 0.87% were found in 2018. A previous study mentioned that the incidence of pregnancies with cardiac disease is in the range of 0.4 – 4.1% worldwide.<sup>2</sup> Several previous study in RSUP Dr. Mohammad Hoesin Palembang, RSUP Sanglah Denpasar, and RSUP Dr. Kariadi Semarang found similar findings. The prevalence rate were found at 0.58% in RSUP Dr. Mohammad Hoesin

Palembang, 1.10% in RSUP Sanglah Denpasar, and 0.97% in RSUP Dr. Kariadi Semarang.<sup>2,6,7</sup>

##### The sociodemographic characteristics of pregnant women with cardiac disease

In this research, pregnancies with cardiac disease were most commonly found in the range of 20 – 35 years old maternal age group (64.7%), the multiparity group (57.4%), the range of ≥34 – <37 weeks gestational age group (38.2%), and the high school educational level group (86.8%).

Based on a study by Kharazmi, et al., mothers who gave birth at the age of ≤25 years old for the first time had a five times greater risk of developing myocardial infarction and two times greater risk of experiencing arrhythmias. The increased risk for hypertension, myocardial infarction, angina pectoris, arrhythmia, and cardiac failure also occurs every year decreases in maternal age at first delivery.<sup>10</sup> Another study by Liu, et al., stated that mothers who gave birth at the age of 35-39 years old had a 1.5 times higher risk of developing cardiac disease, and this risk increased to 1.7 times greater when delivery was performed at the age of ≥40 years old.<sup>11</sup> These two findings are different from the results obtained in this study. Both previous studies



6 compared pregnant women with cardiac disease to women without cardiac disease as a control group. Meanwhile, this research only observed the age distribution of pregnant women with cardiac disease without comparing them to the control group. However, similar results stated that the highest distribution of pregnant women with cardiac disease was in the range of 20 – 35 years old maternal age group, found in several previous studies conducted in RSUP Dr. Mohammad Hoesin Palembang (70.8%), RSUP Sanglah Denpasar (80.0%), and RSUP Dr. Kariadi Semarang (78.0%).<sup>2,6,7</sup>

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Based on a previous study by Furenäs, et al., an increase in the number of parities occurred along with an increase in the proportion of cardiac complications.<sup>12</sup> Another previous study by Parikh, et al., suggested that the association between parity and cardiovascular disease formed a pattern resembling the letter J, with the multiparity group as the lowest risk point.<sup>13</sup> The two findings are different from the results obtained from this research. The difference is since this research only observed the distribution of parity of mothers with cardiac disease without comparing it to the control group, in contrast to the two previous studies. The difference is because this research only observed the distribution of parity of mothers with cardiac disease without comparing it to the control group, in contrast to the two previous studies. However, a similar result suggested that multiparity was a parity group with the highest distribution of pregnant women with cardiac disease, found in a study in RSUP Dr. Kariadi Semarang (50.8%).<sup>2</sup>

A previous study by Stangl V, et al., stated that preterm birth as a complication of the fetus and neonate was twice as high in the group of pregnancies with cardiac disease as in the group of pregnancies without cardiac disease.<sup>14</sup> Another previous study in RSUP Dr. Kariadi Semarang

found a similar finding. It stated that as many as 60.0% of pregnant women with cardiac disease were found to give birth at 32-36 weeks gestational age, while those who gave birth at 37-41 weeks gestational age were only found at 40.0%.<sup>2</sup> Both findings are in line with the result of this research.

A previous study by Dégano, et al., suggested that higher education level was a protective factor against cardiovascular disease with a risk of 0.51 times lower than the lower educational level.<sup>15</sup> Another previous study in RSUP Dr. Mohammad Hoesin Palembang found a similar finding. It stated that the most commonly found level of education owned by pregnant women with cardiac disease was high school education level (79.2%).<sup>6</sup> In addition, several studies in RSUP Sanglah Denpasar, and RSUP Dr. Kariadi Semarang, also found similar results stated that secondary education was the most commonly found level of education owned by pregnant women with cardiac disease (62.22% and 62.7%).<sup>2,7</sup>

#### **The distribution of maternal outcomes based on echocardiographic results**

In this research, peripartum cardiomyopathy was the most common echocardiographic result in pregnancies with cardiac disease (54.4%). A different study in RSUP Dr. Mohammad Hoesin Palembang suggested that hypertensive heart disease was the most common echocardiographic result found in pregnancies with cardiac disease (33.3%).<sup>6</sup> The different number of samples used affects the proportion of echocardiographic results obtained. There were 24 samples only used in the previous study, while 68 study samples were used in this research. However, a study in RSUP Hasan Sadikin Bandung found a similar result. It stated that peripartum cardiomyopathy was the most common

echocardiographic result in pregnancies with cardiac disease (42.1%).<sup>16</sup> In addition, the incidence of peripartum cardiomyopathy is high in developing countries such as Indonesia.<sup>17</sup>

#### **The distribution of pregnancies with cardiac disease based on cardiac functional status**

Here were 66.2% pregnant women found with high-risk cardiac functional status in this research. A different study result in RSUP Kariadi Semarang stated that the percentage of pregnant women with low-risk cardiac functional status (57.4%) was found higher than the percentage of pregnant women with high-risk cardiac functional status (42.6%).<sup>2</sup>

In this research, many referral cases were found in RSUP Dr. Mohammad Hoesin Palembang. Most of these cases were pregnancies with high-risk cardiac functional status. As a result, the distribution of pregnancies with cardiac disease was found more with high-risk cardiac functional status.

#### **The distribution of comorbidities in pregnancies with cardiac disease**

Preeclampsia/eclampsia was the most common comorbidity found in this study (36.8%). Research in RSUP Dr. Kariadi Semarang found a similar finding. It showed that the most common comorbidity found in pregnancy with cardiac disease was preeclampsia/eclampsia (16.9%).<sup>2</sup> Hypertension is the most common health disorder in pregnancy worldwide. Among several types of hypertension in pregnancy, the most often type found is preeclampsia/eclampsia.<sup>18</sup> Therefore, preeclampsia/eclampsia became the most commonly found comorbidity in pregnancy with cardiac disease in this study. <sup>22</sup>

Based on theory, abnormalities leading to preeclampsia are similar to those leading to cardiovascular disease. These abnormalities

include metabolic abnormalities, exaggerated inflammatory response/adaptive mechanisms, hypercoagulability, and endothelial dysfunction.<sup>19</sup>

#### **The distribution of pregnancies with cardiac disease based on maternal outcomes**

In this study, the most common maternal outcome of pregnancies with cardiac disease was cardiac failure (70.6%). A previous study by Owens, et al., also suggested that cardiac failure was the most common outcome of cardiac disease in pregnancy.<sup>9</sup>

The most common echocardiographic result in this research was peripartum cardiomyopathy. Cardiac failure is the primary clinical manifestation of peripartum cardiomyopathy due to left ventricular dysfunction. Moreover, the increased cardiac load due to the physiological increase in blood volume during pregnancy leads to cardiac failure.

#### **The distribution of neonates based on perinatal outcomes**

Low Birth Weight (LBW) was the most common perinatal outcome (64.4%) found in neonates born to women with cardiac disease. A previous study in RSUP Dr. Soetomo Surabaya also suggested that LBW was the most common perinatal outcome (58.8%) suffered by neonates born to women with cardiac disease.<sup>20</sup>

Ventricular dysfunction and increased cardiac load due to cardiac disease during pregnancy lead to poor uteroplacental perfusion so that nutrients and oxygen delivered to the fetus are inadequate and the neonate has difficulty achieving an average birth weight. Delivery performed at gestational age below 37 weeks in pregnancies with cardiac disease for several indications, including complex cardiac lesions, severe cardiac dysfunction, cardiac failure, aortic dilatation,

Eisenmenger syndrome, or the use of heparin therapy on mechanical valves, can also cause the neonate difficult to reach an average birth weight.<sup>21</sup>

#### **The distribution of maternal outcomes based on echocardiographic results**

The highest percentage of maternal mortality (28.6%) and stroke (14.3%) in this study was found in pregnant women with hypertensive heart disease. The highest percentage of cardiac failure (91.9%) was found in pregnant women with peripartum cardiomyopathy. Meanwhile, the highest percentage of arrhythmia (16.7%) was found in pregnant women with ischemic heart disease.

Chronic hypertension is the cause of hypertensive heart disease as well as a predisposing factor for stroke.<sup>22</sup> Hypertensive heart disease can cause an increase in cardiac load so that left ventricular hypertrophy can occur. An increase in left atrial pressure can occur in this condition, resulting in structural, functional, and electrophysiological changes in the left atrium called atrial cardiomyopathy.<sup>23</sup> Atrial cardiomyopathy triggers the formation of cardioembolism, which can block the cerebrovascular flow resulting in stroke.<sup>24</sup> Increased left atrial pressure can also trigger pulmonary hypertension leading to impaired maternal perfusion and maternal mortality can occur if this condition persists.

A previous study by Owens, et al., stated that the highest percentage of cardiac failure (29.14%) was found in pregnant women with peripartum cardiomyopathy.<sup>9</sup> In peripartum cardiomyopathy, cardiac failure is the primary manifestation due to impaired left ventricular contraction.<sup>25</sup> Therefore, in this study, cardiac failure was most often found in pregnant women with peripartum cardiomyopathy.

Ventricular tachycardia is the type of arrhythmia found in this study. Ischemic heart disease is the leading cause of ventricular tachycardia.<sup>26</sup> Ionic and metabolic changes of the myocardium can cause impaired potential action and resting membrane of the myocardium leading to ventricular tachycardia.<sup>22</sup>

#### **The distribution of maternal outcomes based on cardiac functional status**

Overall, maternal outcomes of pregnant women with cardiac disease in this study were most commonly found in pregnant women with high-risk cardiac functional status, including maternal mortality (17.8%), cardiac failure (100.0%), arrhythmia (2.2%), and stroke (2.2%). Research in a hospital in Canada stated that one of the predictors of cardiovascular complications such as cardiac failure, arrhythmia, thrombosis and stroke in pregnant women was high-risk functional status.<sup>4</sup> Deteriorating cardiac functional status indicates poorer maternal perfusion so that the risk of poor maternal outcomes increases.

#### **The distribution of perinatal outcomes based on echocardiographic results**

The highest percentage of prematurity (71.4%), LBW (85.7%), and IUFD (14.3%) were found in neonates born to women with hypertensive heart disease, the highest percentage of IUGR (46.3%), neonatal mortality (14.6%), and perinatal asphyxia (51.2%) were found in neonates born to women with peripartum cardiomyopathy, and the highest percentage of stillbirth (14.3%) was found in neonates born to women with congenital heart disease.

Hypertensive heart disease leads to left ventricular dysfunction due to increased cardiac load.<sup>24</sup> In this condition, uteroplacental

perfusion is disturbed so that the oxygen and nutrients needed by the fetus are not sufficient. It causes the fetus difficult to achieve an average birth weight and even causes intrauterine fetal death. Delivery performed at gestational age below 37 weeks in pregnancies with cardiac disease for several indications, such as severe cardiac dysfunction and cardiac failure in pregnancies with cardiac disease also can lead to prematurity so that the fetus difficult to achieve an average birth weight.

Based on a previous study by Elliott C, et al., most cases of perinatal asphyxia were found in neonates born to women with peripartum cardiomyopathy.<sup>27</sup> Another previous study in RSUP Dr. Hasan Sadikin Bandung also suggested that most IUGR cases (12.5%) were also found in neonates born to women with peripartum cardiomyopathy.<sup>16</sup> These two findings are in line with the research results obtained. Impaired left ventricular contraction of the cardiac in peripartum cardiomyopathy can cause impaired uteroplacental perfusion so that the fetus is deprived of oxygen and nutrients. As a result, fetal growth in utero is impaired and perinatal asphyxia may occur. This condition can lead to neonatal death. Decreased systemic vascular resistance that physiologically occurs in pregnant women triggers a right-to-left shunt of cardiac blood flow in pregnant women with congenital heart disease.<sup>28</sup> This condition causes impaired oxygen perfusion and increased cardiac load. Therefore, nutrients and oxygen to the fetus are inadequate to prevent stillbirth.

#### **The distribution of perinatal outcomes based on cardiac functional status**

Overall, perinatal outcomes in this study were mostly suffered by neonates born to women with high-risk cardiac functional status, including prematurity (64.0%), LBW (80.0%), IUGR (52.0%),

IUFD (2.0%), stillbirth (8.0%), neonatal mortality (14.0%), and perinatal asphyxia (50.0%). Based on Caudhari et al., NYHA III and NYHA IV cardiac functional status were associated with poor fetomaternal outcomes.<sup>29</sup> Deteriorating cardiac functional status indicates poor uteroplacental perfusion so that the risk of poor perinatal outcome increases.

#### **5. Conclusion**

The prevalence of pregnancies with cardiac disease in RSUP Dr. Mohammad Hoesin Palembang was 0.87% in 2018, 2.47% in 2019, and 1.48% in 2020. The most common maternal outcome in this study was cardiac failure, with most in the peripartum cardiomyopathy group. While, the most common perinatal outcome was low birth weight, with most in the hypertensive heart disease group.

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