ASSOCIATION BETWEEN HEART DISEASE IN PREGNANCY WITH CARDIAC EVENTS

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ABSTRACT

Pregnancy in heart disease is at high risk for cardiac events. Heart failure (NYHA III-IV), ejection fraction (EF)<40%, cyanosis and left ventricle obstruction (MVA< 2 cm2 or AVA <1.5 cm2) are parameters that still use in predicting cardiac events in pregnancy. But in clinical experience, pregnancy with MVA 1.5-2 cm2 still can have the pregnancy without cardiac events. These parameters haven’t included congenital heart disease (CHD) and hypertension with preserved EF and cyanosis hadn’t still occurred has the potency the occurrence of cardiac events. To date, no exact parameters associate with severity of CHD are high risk for occurrence cardiac events in pregnancy. The objective was to prove MVA <1.5cm2, CHD with PASP >60 mmHg, and chronic hypertension with left ventricle hypertrophy as risk of occurrence for cardiac events in pregnancy. Ninety two pregnant women with mitral stenosis, MVA < 1.5cm2, CHD with PASP >60 mmHg and chronic hypertension with left ventricle hypertrophy based on registry from 2002 to 2007, retrospectively through medical record and classified into groups based on occurrence of cardiac events. Ninety two pregnant women in 5.5 year period fulfilled inclusion criterias. 46.75% had cardiac events. There are significant association between MVA <1.5cm2 (CI 1.61-78.56, p=0.01), CHD with PASP > 60 mmHg (CI 1.97-19.04, p=0.01) and chronic hypertension with left ventricle hypertrophy (CI 1.16-52.35, p=0.001) with the occurrence of cardiac events. In conclusion, pregnancy with severe MS, CHD with pulmonary hypertension moderate-severe and chronic hypertension with left ventricle hypertrophy are at risk of cardiac events along the pregnancy.

Keywords: pregnancy, heart disease, cardiac events

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INTRODUCTION

Pregnancy is a physiological state experienced by women of childbearing age. This situation is unique and when combined with heart disease and still wants her pregnancy progresses, this was due to structural abnormalities of the heart will increase the risk of morbidity and mortality both in the mother or the fetus as a result of hemodynamic changes during kehamilan.1 Improved hemodynamics during pregnancy and childbirth provides its own burden on the heart, so will aggravate and ignite a variety of complications, especially if there was previous heart disease.

Pregnancy with heart disease include 1% of all pregnancies with varying patterns of each country. In developed countries congenital heart disease (CHD) was ranked first, while in developing countries largely due to rheumatic heart disease, followed by hypertensive heart disease due to hypertension is not terkontrol2 Rheumatic heart disease is still a problem in developing countries with the death rate per 400 000. Most of these diseases on the mitral valve in mitral stenosis (MS) and/or insufficiency, with a prevalence of 25%-40% per year.3 contrast with rheumatic heart disease in America is relatively stable insident CHD ie 8 of 1000 live births whereas in Indonesia, according Ganesja et al found nine live births from 1000 or 40 000 infants pertahun.4 With the advances in therapy diagostik and 85%-90% of infants with CHD can live into adulthood with an increased silent 5% pertahun.6 Another problem facing the world is the health of hypertension (HT), these diseases include 40% of all cases of cardiovascular disease with the incidence increasing from year to tahun.7 Physiological pregnancies without cardiac abnormalities have a risk of maternal mortality is less than 1%, with the accompanying heart disease mortality increased an average of up to 4%.8 DS Research Bambang and his friends at Dr Soetomo got a case of pregnancy with heart disease from year to-year increase. In the years 1972-1973 showed 0.3%, in 1978-1982 amounted to...
0.5%, while in the year 1990 to 1993 reached 0.65% with a mortality rate in 1990 amounted to 4.88%.

Patients with mitral stenosis will occur so that the left heart obstruction transmitral flow is interrupted, the CHD is generally an increase in volume and pressure in the right heart, whereas a marked hypertensive patients with chronic left ventricular hypertrophy (Hvki) will be followed by diastolic dysfunction as a result the patient has no tolerance with increasing preload. Increased heart rate (heart rate) and plasma volume and decrease resistance perfif during pregnancy and childbirth will burden the heart so that the risk of incidence of cardiac complications (cardiac events) in patients with heart disease at the top.

Research conducted Siu et al found significant differences in the occurrence of cardiac events in women with heart disease compared with normal pregnant women. Cardiac events are dimaksut include: sudden death due to cardiac (cardiac deaths), pulmonary edema, stroke, threatening arrhythmias and decreased functional status ≥ 2 classes according to Barker et al NYHA10 set some parameters as a risk factor for cardiac events, risk factors are: the existence lesions on the heart before the pregnancy, history of the patient clinical condition, heart failure (NYHA class III-IV) or cyanosis, decreased left ventricular function (ejection fraction (EF) <40%), left heart obstruction (Mitral valve area (MVA) <2 cm2, aortic valve area (AVA) <1.5 cm2 or left ventricular outflow trac peak gradient> 30 mmHg).11

Research Barker et al have not entered another heart disease risk factors occurred despite the theoretical potential for cardiac events with increasing preload, such as chronic hypertension accompanied by Hvki. Besides, the research was too far away to determine parameters of cyanosis as a risk factor that has not yet CHD cyanosis with an EF which is still good potential also occurs in cardiac events when triggered by increased preload during pregnancy. Determination of MVA <2 cm2 will increase sensitivity and lower specificity of these parameters therefore included patients with mild MS as a risk factor. Yet clinical experience in patients with mild MS (MVA 1.5 to 2 cm2) rarely cause complaints, thus no intervention. The problem is whether there are other parameters that can be used as a risk factor of CHD occurs long before cyanosis, such as the estimated value of Pulmonary artery systolic pressure (PASP). Then is it true can still be mild MS mentolir pregnancy and chronic hypertension with Hvki really a lot we encounter in everyday practice may be triggering cardiac events in pregnant women. On the basis of the above it is important to do research on the relationship between heart disease in pregnant women with risk of cardiac events are the results expected to be used as a parameter of risk factors in everyday practice in an effort to improve services and reduce maternal mortality rate from heart disease. Heart disease in pregnant women in this study included patients with MS, chronic hypertension with Hvki and PJB asianosis (ASD, VSD, PDA). The cardiac events were observed according to the results of Siu’s research.

MATERIALS AND METHODS

This study uses an observational analytic design of cross sectional. This research was conducted in a maternity room and Dr Cardiovascular Room. Soetomo. Ninety two pregnant women with mitral stenosis, MVA < 1.5cm2, CHD with PASP >60 mmHg and chronic hypertension with left ventricle hypertrophy based on registry from 2002 to 2007, restropectively through medical record and classified into groups based on occurrence of cardiac events.

Data were analyzed by descriptive and inferential statistics presented in the form of pictures, graphs and tables with percentage and ratio scale using computer program SPSS 11.5

RESULTS

During the period of five and a half year there were 116 pregnant women with heart disease who were treated at dr Soetomo and who meet the criteria for inclusion as many as 92 patients. Of the 92 patients who suffered cardiac events as many as 43 people or 46.74%. Group who did not experience cardiac events by 49 persons or 53.26%.

Found an average maternal age 31 years with a range of 16-42 years. Average between 35 weeks gestational age range 18-40 weeks, 93% EF samples above 50% and 94% O2 saturation above 90% sample. Based on no statistically significant differences in all maternal age-related sample characteristics, gestational age, parity, and EF with oxygen sarurasi keseluruan P value ≥ 0.05. Thus the possibility of the five factors above affects the occurrence of cardiac events on the study was not statistically significant.

Cardiac events are most commonly found in pregnant women with cardiac disease is heart failure(NYHA class decreased ≥ 2) followed by pulmonary edema.
Table 1. Type of cardiac events in pregnant women with heart disease

<table>
<thead>
<tr>
<th>Cardiac events</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure (NYHA IV)</td>
<td>25</td>
<td>58.14%</td>
</tr>
<tr>
<td>Lung edema</td>
<td>8</td>
<td>18.60%</td>
</tr>
<tr>
<td>Heart failure + arrhythmia</td>
<td>4</td>
<td>9.30%</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>3</td>
<td>6.98%</td>
</tr>
<tr>
<td>Cardiac deaths</td>
<td>2</td>
<td>4.65%</td>
</tr>
<tr>
<td>CVA</td>
<td>1</td>
<td>2.33%</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>100%</td>
</tr>
</tbody>
</table>

Arrhythmia most commonly found in people with MS in the form of atrial fibrillation rapid ventricular response, whereas cardiac death sudent found on IPM PJB by weight and Eisenmenger. The distribution of heart disease based on risk factors shown in Figure 1.

In this study, MS with MVA > 1.5 cm², CHD with an estimated PASP < 60 mmHg and hypertension without Hvki included in the group without risk factors.

Distribution of cardiac disease in pregnant women who experience cardiac events is shown in Figure 2.

Table 2. Distribution of pregnant women based on the type of heart disease

<table>
<thead>
<tr>
<th>Variabel</th>
<th>Cardiac events</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(+)</td>
<td>(-)</td>
</tr>
<tr>
<td>MS: MVA &gt; 1.5 cm²</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>MVA ≤ 1.5 cm²</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>CHD: PASP &lt; 60 mmHg</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>PASP ≥ 60 mmHg</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>HT: Hvki (-)</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Hvki (+)</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>49</td>
</tr>
</tbody>
</table>

Mitrail stenosis

On the analysis using Chi-square test, showed a significant correlation between MVA ≤ 1.5 cm² with incidence cardiac events in pregnant women \(p \leq 0.05\) with continuity correction 4.90 and \(p = 0.02\) level of significance. Cardiac events occurred most frequently were NYHA class IV heart failure accompanied by pulmonary edema and arrhythmias (AF).

CHD with IPM

On the analysis using Chi-square test, showed a significant correlation between CHD with an estimated PASP ≥ 60 mmHg with timbunya Cardiac events in pregnant women \(p \leq 0.05\) with continuity correction 2.68 and \(p = 0.05\) level of significance. There were two patients from group with risk factor (estimated PASP ≥ 60 mmHg) who experienced sudden cardiac death. Cardiac events that often occur are NYHA class IV heart failure and arrhythmias.

Hypertension with Hvki

On the analysis using Chi-square test, showed a significant correlation between hypertension with Hvki
Association between Heart Disease in Pregnancy with Cardiac Events (Suryono, Jatno Karyono)

against timbunya Cardiac events in pregnant women \( (p \leq 0.05) \) with a continuity correction of 24.73 and \( p = 0.00 \) level of significance. There were no patients from the group without risk factors (hypertension without Hvki) who experienced Cardiac events. Cardiac events are most often happens is that heart failure NYHA class IV and only one patient who experienced CVA and arrhythmias.

Analysis of the next phase of the three variables together by using binary logistic regression test didapakkan significant correlation between MVA \( \leq 1.5 \) cm 2, CHD with an estimated PASP \( \geq 60 \) mmHg and hypertension in pregnancy with timbunya Hvki cardiac events (Nagelkerke R square 0628 ).

The statistical results obtained that the risk of cardiac events timbunya likely the biggest in the CHD group PASP \( \geq 60 \) mmHg which is 27 times larger than the CHD PASP \( <60 \) mmHg \( (p = 0.013) \) followed by MS MVA \( \leq 1.5 \) cm 2 for 11.25 times larger than the MS MVA> 1.5 cm2 \( (p = 0.015) \), while in the hypertensive group with the possibility of cardiac events Hvki 7.8 times greater when compared with hypertension without Hvki.

DISCUSSION

Basic characteristics of each related group maternal age, gestational age, parity, ejection fraction and oxygen saturation in balance. There is no tendency of a confounding variable effect on one group, so hopefully the two groups are homogeneous. Homogeneity of the sample in this study need to be analyzed considering the previous research stated above five factors can be as confounding variables on the incidence of cardiac events.

Incidence cardiac events occurred in all three groups during the third trimester and most often occurs during and after delivery. This can dingerti therefore significant hemodynamic changes occurred over weeks to 20 and did not change significantly until the third trimester. Hemodynamic changes occur before and again after delivery.

Association between MS with the occurrence of cardiac events

Showed a significant correlation \( (p = 0.02) \) between MS MVA \( \leq 1.5 \) cm 2 with the occurrence of cardiac events with a ratio of 3.16 prevalent. Cardiac events are common in this group were NYHA class IV heart failure, followed by pulmonary edema and AF. This is understandable because MS with MVA \( \leq 1.5 \) cm2 transmitral obstruction that occurs in LA and the vascular pressure increases lung. Increased LA pressure is very sensitive to the increase in heart rate, thus triggering the emergence of arrhythmia (AF) .9,27

Increased venous return during pregnancy, prior to and after delivery due to backflow from choriodecidual cavity into the circulatory system due to uterine contractions lead to heart failure and pulmonary edema. Increased heart rate and sympathetic sensitivity in pregnant women will shorten the charging time ventricles so penurunankan stroke volume resulting in decreased cardiac output. If things are not addressed will cause hypotension and even cardiogenic shock. The heart rate is quite safe in these patients ranged from 60-80 kali/menit.9, 27 Maintaining sinus rhythm in pregnant women with MS is important because LA contraction in late diastole help reduce pressure LA. When a patient falls on AF LA pressure becomes higher and more susceptible to changes in hemodynamic pada kehamilan.27

Research Siu and Khairy said: MS MVA <2 cm2 timbunya risk factor for cardiac events in a pregnant woman and five times greater than normal people (MVA> 2 cm2). In this research through statistical test phase two with Binary logistic regression with a limit of MVA \( \leq 1.5 \) cm 2 is obtained: MS MVA \( \leq 1.5 \) cm 2 11.25 times greater risk of cardiac events compared with mild MS (MVA> 1.5 cm2). This difference is due to Siu wore the MVA is greater than 2 cm2 and the comparison is a normal person. Means that women with mild MS should be performed before undergoing pregnancy interventions to prevent cardiac events. Whereas the American Heart Association (AHA) recommends that interventions conducted in moderate or severe MS (MVA \( \leq 1.5 \) cm 2) with another symptom27 also in Indonesia, especially in Surabaya rarely even make interventions at the MS MVA> 1.5 cm2. However, research Siu at least increase our vigilance when dealing with MS patients (regardless of size MVA) with pregnancy.

Association between CHD with occurrence of cardiac events

Showed a significant correlation \( (p = 0.05) \) between the CHD with an estimated PASP \( \geq 60 \) mmHg with the occurrence of cardiac events with a ratio of 2.02 prevalent.

Cardiac events arising in the form of sudden death experienced by two patients (severe ASD and VSD Esienmenger IPM), arrhythmia and heart failure. Increased pressure and / or volume in the RA / RV result of increased pulmonary vascular resistance can
not be mentolirir hemodynamic changes during pregnancy. There are two important changes that trigger timbunya Cardiac events in pregnant women. First, the increase in plasma volume during pregnancy, prior to and post labor will increase venous return result in the RA and RV strain will increase and trigger the emergence of arrhythmia. Addition of venous return also trigger right heart failure due to high pressure in the pulmonary artery caused by the CHD. Second, systemic resistance decreased during pregnancy, coupled with increased venous return resulting from changes in the direction of shunt into the right to the left so that the sufferer becomes cyano sis. Postpartum hemorrhage will reduce afterload, flow from right to left shunt increased patient weight will occur cyano sis, hypotension and even cardiogenic shock. When the CHD is accompanied stenosis in tetralogy of Fallot eg, increased heart rate and the sympathetic sensitivity during pregnancy that causes CHDsm of the infundibulum to the pulmonary blood flow decreases drastically as a result patients have been hipoxic spell 12,17,28

Changes in stroke risk shunt direction, encephalitis and brain abscess due to several reasons: First, most do not experience venous blood filtering effects in the lung, so that the germs in other places are easily reached the brain. Secondly, compression of the inferior vena cava due to enlargement of the uterus resulted in venous flow becomes stagnant, this condition mikrotrombus spur formation. The change mikrotrombus shunt was easily reach the brain. Third, after the placenta occurs regardless of compression of the uterus and occur behind the heavy flow of choriodecidual into the vascular cavity, the amniotic compartment that escapes can easily reach the brain. Here a little different with the CHD which have undergone previous cyano sis, prolonged cyano sis hiperviskositas effect plays an important role on the incidence of complications diatas5, 12,17,29

In patients with PHT had even Eseinmenger hemodynamic changes during pregnancy would aggravate flow to left cardiac shunt. In this condition the patient fell into severe cyano sis with all its consequences. The problem is how much the degree of PHT that could not be mentolirir hemodynamic changes during pregnancy in the CHD asianotik. In this study, the results of the CHD with an estimated PASP ≥ 60 mmHg strongly associated with risk of cardiac events in pregnant women when compared to the estimated PASP <60 mmHg.

**Association between HT with the occurrence of cardiac events**

Showed a significant correlation (p = 0.00) between hypertension with Hvki in pregnant women with the occurrence of cardiac events with a ratio of infinity prevalent. In the first phase of analysis with chi-square ratio obtained by the infinite prevalent because the research sample was not obtained in the group of hypertensive cardiac events without Hvki so the calculation, the denominator is zero. But at the Binary logistic regression analysis showed a significant relationship.

The most frequent cardiac events occurred in this group were NYHA class IV heart failure this can be understood because of hypertension with Hvki diastole dysfunction has occurred thus increasing venous return, heart rate and catecholamines in pregnancy can lead to heart failure.27

In the early stages of hypertension, left ventricular structure and function normally even though there has been diastole dysfunction. Mentioned that more than 40% penderta heart failure have an EF> 50%, this suggests that changes in the functions of diastole is an early hemodynamic changes in patients with hypertension. 27.30

There are three stages of hypertrophy on the incidence of hypertension. The first phase, the increase in cardiac work per unit of weight through physiological hipervfungsi. The second phase, Hvki without or with ECG abnormalities (ST segment changes). The third stage, cellular fatigue that leads to heart failure. In Hvki can occur several conditions: the increase of connective tissue, contractile cell death and growth kardiomiosit. This situation will cause an increase in left ventricular filling that is reflected in the increase of LVEDP and LA dilatation. 21.30

Hypertension with no change in the ECG has Hvki performance systole and diastole function is similar to group Hvki hypertension accompanied with the ECG changes. However, one study reported that the function of myocardial contractility has appeared in the group of hypertension with Hvki without ECG changes. This proves that Hvki in hypertension has occurred systole dysfunction in myocardial cells, although the level of global systole function was still normal. The underlying abnormality is why hypertension is not able mentolirir Hvki hemodynamic changes during pregnancy and persalinan.30

Increasing plasma volume during pregnancy or excessive increase in venous return before and after delivery due to backflow from the cavity into the circulatory system choriodecidual result of uterine contractions cause dilatation of the RV cavity and place the emphasis toward the LV septum. Emphasis will
reduce third area that aggravate LV dysfunction diastole has happened before. The emphasis of this RV and septum pulahlah which facilitate the emergence of ventricular arrhythmias in pregnant women which have occurred due to the conduction system remodeling Hvki.30

Framingham research proves Hvki hypertension with 10-fold more often likely occur cardia compared with events without Hvki hypertension. In this research found that the result is lower ie 7.8 times larger than without Hvki. The difference can be caused by the sample in the Framingham study was the common people, whereas in this study were specifically pregnant women, which in pregnant women in addition to the above hemodynamic changes also occurred resitensi sistemik.21, 30 researchers assume that this decrease in systemic resistance causes a lower incidence of cardiac events opportunities compared with the Framingham study. A second difference, in the Framingham study timbunya cardiac events is a natural process in line with the progression Hvki, but in this study Cardiac events occur earlier due to provocation hemodynamic changes during pregnancy.

Although large meets the minimum limit of the sample, but the sample size for each type of lesion was less bulky. Disaming the data in this study uses secondary data so penelita can not control each variable

CONCLUSIONS

It can be concluded that (1) there is a relation between the mitral stenosis with MVA \( \leq 1.5 \text{ cm}^2 \) in pregnant women with the emergence of cardiac events; (2) there is a relationship between the CHD to the estimated PASP \( \geq 60 \text{ mmHg} \) in pregnant women with the emergence of cardiac events; (3) there is a relationship between hypertension with Hvki in pregnant women with incidence cardiac events; (4) cardiac events incidence in pregnant women with heart disease is determined more by increasing plasma volume, heart rate and decreased resistance perifir that occur during pregnancy.

We suggested that this issue required a deeper understanding about the influence of hemodynamic changes in pregnant women with heart disease against the risk of Cardiac events by further studies with larger scale, and different research designs. Based on the results of research that shows the relationship between MVA values, estimated PASP and the Hvki in pregnant women with the occurrence of cardiac events, it is expected those parameters can be used as guidelines to predict the incidence of cardiac events when dealing with pregnant women with heart disease.

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