

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20183332>

Original Research Article

Clinical outcomes among pregnant patients with cardiac disease only and those with co-existing pregnancy-associated hypertension

Karishma Gupta¹, Arthika Shetty², Madhva Prasad^{2*}, Alka S. Gupta²

¹Medical Officer, Comprehensive Thalassemia care, Pediatric Hematology-Oncology and BMT Care, Mumbai, India

²Department of Obstetrics and Gynecology, Seth GS Medical College and KEM Hospital, Mumbai, India

Received: 06 June 2018

Accepted: 29 June 2018

*Correspondence:

Dr. Madhva Prasad,

E-mail: madhva@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Impact of cardiac disease on pregnancy is significant. Impact of hypertension on pregnancy is also significant. “Does occurrence of hypertension along with cardiac disease worsen the outcomes?” forms the crux of this study. The aim of the present study was to determine the impact of pregnancy-associated hypertension on the clinical outcomes of pregnant patients with cardiac disease.

Methods: Retrospective, observational, comparative, case control study of one and half year duration conducted in a tertiary care referral hospital. The various medical and obstetric parameters were studied and compared.

Results: Among 143 patients studied, 36 were hypertensive and 107 were non-hypertensive. Non-severe hypertension was seen in 17%, severe hypertension in 4% and eclampsia in 4%. Average age was 26 years and majority were first or second gravida. Valvular heart disease was the most common cardiac disease encountered. Gestational age at delivery, perinatal outcome and occurrence of pulmonary hypertension were all similar in both the hypertensive and non-hypertensive groups. The most common mode of delivery was vaginal delivery. The cesarean section rate was 29% and was similar among both hypertensive and non-hypertensive groups. Requirement for induction of labor, occurrence of small-for-gestational age among the newborns, intensive care unit admission due to heart failure and maternal death was higher (statistically significant ($p < 0.05$) among the hypertensive group.

Conclusions: Presence of hypertension worsens outcomes among pregnant patients with cardiac disease. The coexistence of hypertension and cardiac disease should alert the obstetrician and specialist physician towards a more vigilant management. The findings of this study may help risk stratification (development of pregnancy associated hypertension) while counseling patients with heart disease.

Keywords: Critical care, High risk obstetrics, Heart disease, Hypertension, Medical disorders in pregnancy, Preeclampsia

INTRODUCTION

Cardiac disease continues to have an overwhelmingly high proportion of contribution to the burden of maternal mortalities.¹ The spectrum of cardiac diseases including rheumatic valvular, congenital heart disease, cardiomyopathies and ischemic heart disease can affect pregnant women. Patients with heart disease per se have poor obstetric outcomes.² Ng et al studied a large cohort

of pregnancies and in their study, the diagnosis of heart failure was around 126 cases in 100000 pregnancies. A wide variety of effects of heart disease was observed such as higher rates of preterm birth, cesarean delivery, neonatal death rates, lower birth weights and lower Apgar scores. Overall, a seven-fold increase in risk of death was observed.³ In the Eastern Mediterranean region, rheumatic heart disease contributed to one third of all the total deaths reported, and there appeared to be an

increasing trend, though at a later age.⁴ Congenital heart disease in pregnant women has a significant impact on the occurrence of tachyarrhythmias, cardiac failure and fetal growth restrictions, as shown recently by Hayward et al.⁵

The effect of hypertension in pregnancy is not limited to the time period of pregnancy only. Scantlebury et al have recently shown that history of pregnancy hypertension increases the risk of cardiac remodelling and disorders of rhythm in the future life of women.⁶

The broad term “pregnancy-associated hypertension” encompasses pregnancy-related conditions including gestational hypertension and pre-eclampsia. It is also common knowledge that hypertensive disorders of pregnancy worsen obstetric outcomes independently.

Duhig et al in their review, state that almost 60000 women die every year on account of hypertensive disorders.⁷ Sutton et al in their review have stated that 10% of all morbidity and mortality in pregnancy can be ascribed to hypertensive disorders.⁸

Hence, it is clear that cardiac disease and pregnancy hypertension independently cause high amount of obstetric morbidity. What happens when both these disorders coexist? The question arises “How much do hypertensive disorders worsen outcomes in patients with heart disease”.

This paper addresses this research question. This retrospective case-control study compared the outcomes among those with cardiac disorders without hypertension and those with hypertensive disorders. It was hypothesized that there would be worse outcomes in the group of patients who had co-existing hypertension.

METHODS

A retrospective case control study was conducted in a tertiary care hospital after institutional ethics committee permission. Case files of patients who had been managed and delivered in the obstetric department of the hospital were reviewed for a period of 18 months. There was no interaction of the study investigators with any patients and no consents were obtained.

All pregnant patients with pre-existing cardiac disease; freshly diagnosed cardiac disease; cardiac disease detected on autopsy were included. Patients with chronic hypertension, pre-existing renal disorders, auto-immune disorders, co-existing diabetes and those who aborted or underwent medical termination of pregnancy prior to 20 weeks of gestation were excluded.

Patients with cardiac disease and hypertension were the “case” group, whereas cardiac disease without hypertension was the “control” group. The various

parameters and outcomes among the two groups were tabulated.

Details regarding age, parity status, presence of hypertension, severity of hypertension (if present), use of antihypertensive drugs, nature of cardiac lesion (valvular, congenital, others), gestational age at delivery (in weeks of gestation, and divided into term/ preterm as per standard definition), appropriateness of the baby weights for the gestational age (appropriate for gestational age or not), mode of delivery (vaginal or cesarean delivery), presence or absence of pulmonary hypertension, whether labor induction was required, need for intensive care unit admission, perinatal outcome (survival or not), any history of cardiac intervention (prior to pregnancy or during pregnancy) and occurrence of maternal mortality were all noted. All these were obtained from the obstetric labor ward register and the case files accessible from the medical records department.

The institution handles around 150 cases of heart disease in a year. Since recent records in the medical records department were more easily obtainable, it was decided to study all cases of cardiac disease (satisfying inclusion criteria) in the recent one and half years, retrospective from the moment of obtaining of institutional ethics committee approval.

The labor ward has a meticulously maintained register with documentation of patients with high risks. This helped in accurate identification of all patients with heart disease, and it is unlikely that any patients were missed out.

The obstetric, medical and cardiac management of all the patients were similar due to following of an institutional protocol. The same investigator noted all the parameters and hence uniformity of obtaining of the data was ensured. Diagnostic criteria for pregnancy-associated hypertension, as mentioned in standard obstetric texts were used to include patients in the “case” group. All cardiac diseases were included and analyzed together. There was no subgroup analysis based on different cardiac lesion diagnosis.⁹

After appropriate tabulation was made, comparative statistical analysis was performed with the intention of comparing outcomes between those in the normotensive group and those in the hypertensive group. This was done using the Fischer exact test and (two-tailed) p- value was calculated and tabulated.

RESULTS

A total of 143 patients were studied based on the above described criteria. There were no patients who had two deliveries during the study period. There were no patients with multiple gestations. There were 36 patients in the hypertensive group, while there were 107 in the normotensive group. In the entire study subjects, 84%

belonged to the age group of 20-30 years. As shown in table no 1, there is no significant relation between age and occurrence of hypertension in this group.

Table 1: Age distribution among the two groups.

Age	Cardiac only (n=107)	Cardiac + hypertension (n=36)
20-25	59(55.14%)	19 (52.7%)
26-30	32(29.91%)	11 (30.5%)
31-35	16(14.95%)	5 (13.8%)
>36	0(0)	1(2.7%)
Chi squared = 0.201, dF= 2, P value = 0.9042		

Only 10% belonged to 4th gravida or beyond. As shown in table no 2, the occurrence of hypertension correlated significantly ($p<0.05$) with increasing gravidity.

Table 2: Parity distribution among the groups.

Gravidity	Cardiac only (n=107)	Cardiac + hypertension (n=36)
1	46 (42.99%)	12 (33.3%)
2	34 (31.78%)	9 (25%)
3	17 (15.89%)	13 (36.1%)
4	9 (8.4%)	2 (5.5%)
5	1 (0.93%)	0
Chi square value 11.994, dF= 3, p value=0.0074		

Presence and severity of hypertension: As shown in figure 1, While 75% were normotensive, the remaining were hypertensives. Among these, 17% were non-severe, 4% were severe and eclampsia was seen in 4%.

Table 3: Antihypertensive usage distribution.

Antihypertensives	N=143 (%)	Cardiac + hypertension (n =36)	Cardiac only (n=107)
None	76 (53.1)	13	63
Labetalol	4 (2.7)	4	0
Nifedipine	8 (5.7)	8	0
Metoprolol	44 (30.8)	0	44
Multiple	11 (7.7)	11	0

Medication usage: Thirty-four patients were on no medications. Ninety-two patients were on furosemide oral or injectable during the course of their pregnancy. Thirty-eight patients were on intermittent injectable penicillin prophylaxis. Twenty-two patients were on digoxin. Twenty-six patients were on anticoagulation.

As shown in Table 3, while 53% of patients were not on any antihypertensives, 38% were on a single antihypertensive medication and 7.7% were on multiple medications. Metoprolol, a cardio-selective beta blocker used for rate control in many patients with rheumatic heart disease, is an antihypertensive also.

Table 4: Medical and obstetric outcomes compared between the two groups.

Parameter		Cardiac only (n= 107)	Cardiac + hypertension (n=36)	Statistical significance (if yes, boldened)
Gestational age	Preterm (29.3%)	30	12	P value 0.534
	Term (70.7%)	77	24	
Baby weight outcome	SGA (27.1%)	27	16	P value 0.0366
	AGA (72.9)	80	20	
Mode of delivery	LSCS (28.6%)	29	12	P value 0.524
	Vaginal delivery (71.4%)	78	24	
Pulmonary hypertension	Yes (10.4%)	12	3	P value 0.761
	No (89.6%)	95	33	
Labour Induction required	Yes (10.4%)	6	9	P value 0.0026
	No (89.6%)	101	27	
ICU admission (heart failure)	Yes (51%)	47	26	P value 0.006
	No (49%)	59	19	
Perinatal outcome	Mortality (5.5%)	5	3	P value 0.415
	Survival (94.5%)	102	33	
Cardiac intervention (ever)	Yes (38.4%)	46	9	P value 0.048
	No (61.6%)	58	27	
Maternal outcome	Mortality (6.2%)	3	6	P value 0.008
	Survival (93.8%)	104	30	

Distribution of heart disease

As shown in figure 2, there were 36 patients who had hypertension coexisting with cardiac disorders, while 107 had only cardiac disease. Valvular heart disease formed the most common entity, and congenital heart disease was the second most common group. Among the valvular heart diseases, the most common was a single valvular involvement, the most common of which was mitral stenosis. The conditions included as 'others' were aorto-arteritis, cardiomyopathies, pericardial effusion and others. Cardiomyopathy was observed in 6 patients (5 hypertensives, 1 non-hypertensive). Table 4 shows the various medical and obstetric outcomes and their comparison between the hypertensive and non-hypertensive group.

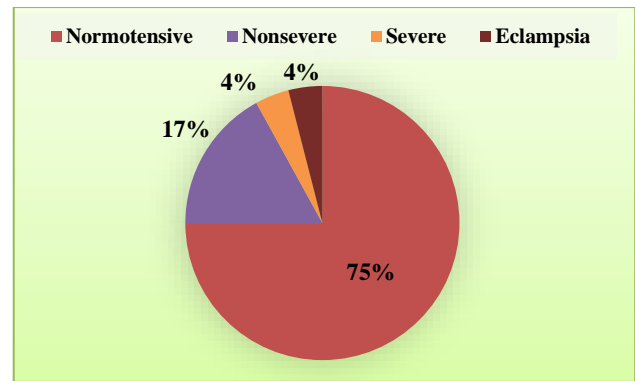


Figure 1: Distribution of hypertension among the patients.

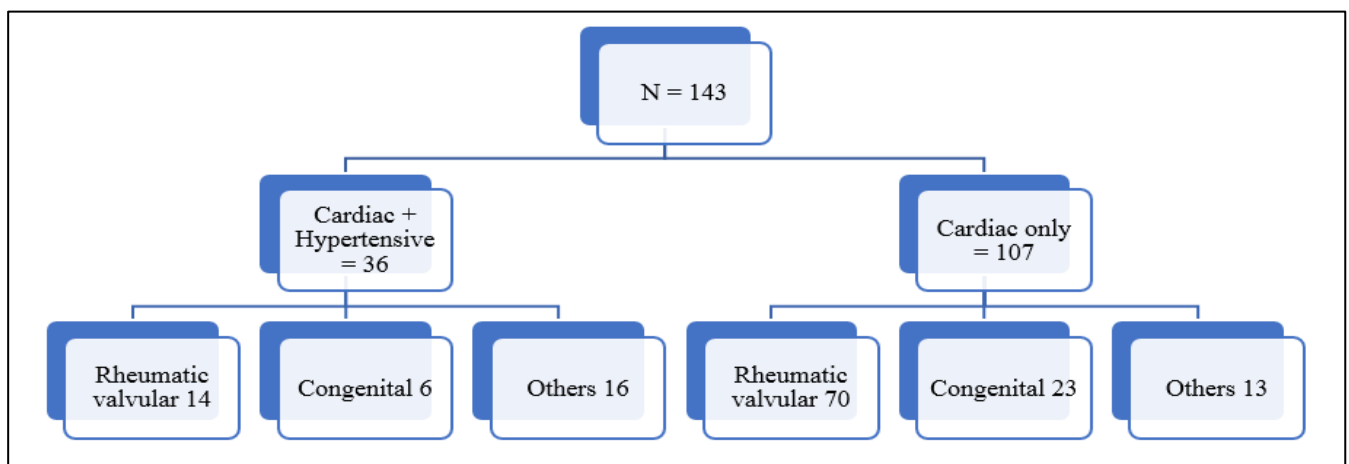


Figure 2: Distribution of cardiac lesions.

DISCUSSION

A literature search showed us lacunae in the presence of studies analyzing morbidity caused by hypertension complicating pregnancies with cardiac lesions. Majority of the patients belonged to the 20-30 age group. This is similar to the findings of the study by Konar H et al, who described the collated pregnancy outcomes in heart disease studied from 5 different teaching hospitals in India. It is observed that the age group affected in developing countries is much younger than in the developed countries.¹⁰ The age distributions among the hypertensive and non-hypertensive groups were comparable. In present study 58% had rheumatic valvular heart disease and 20% had congenital heart disease. However, in the developed countries, the proportion of rheumatic valvular heart disease is consistently lesser. In the study by Huisman et al, only 22% contributed to the same.¹⁰ In the study by Roos-Hesselink et al the prevalence of valvular heart disease was 25%.¹¹ In the study by Hink et al also, congenital heart disease formed the largest group with 53% and rheumatic heart disease formed a much smaller group.¹² In developing countries

like Brazil, the profile is similar to our findings; with a rate of around 55% for rheumatic valvular heart disease, followed by congenital heart disease (19%).¹³ Findings from a study in Thailand also show a similar profile.¹⁴ The study by Konar H et al also, similar percentages have been reported.

Incidence of hypertension in heart disease

In present study, 25.1% were complicated by hypertension. In the study by Hink et al, in which 160 pregnancies were studied, 13.5% were complicated by hypertension. In the case series by Huisman et al, 25% were complicated by pregnancy-associated hypertension. Surprisingly, and in contrast to our findings, a case series (of 93 cases) reported by Stangl et al found only 4 cases complicated by pregnancy-associated hypertension.¹⁵ The study by Konar H et al does not specify the incidence of hypertension in their patient cohort. An analysis by Subbiah et al which describes the outcomes among around 100 cardiac patients has also not studied the effect of hypertension.¹⁶ A large case series presented by Avila

et al have also not specifically reported on pregnancy-associated hypertension.¹⁷

Induction of labour

In present study, labor induction was required in only 10% of patients, and this rate was higher among hypertensive patients. In the studies by Huisman et al and Hink et al, induction of labor was performed in 19% and 30% respectively. However, in the study by Konar et al labor induction was required only in 3.3%.

Delivery mode

Considering the risks that an operative procedure can pose to the hemodynamic parameters in a patient with heart disease, cesarean section is reserved for obstetric indications. The rates of cesarean section in various studies are heterogeneous. In the study by Hink et al, the cesarean section rate was 25%. In the study by Roos-Helnic et al, the rate of cesarean section was 41%.¹¹ In the study by Huisman et al, the overall cesarean section rate was 54.8%.⁴ However, in the study by Campanharo et al, the rate of cesarean section reached 77%.¹⁸ Patients with congenital heart disease have also been reported to have a higher rate of cesarean compared to normal population.¹⁹ In present study, we found a 27% cesarean section rate in the normotensive group and 33% rate in the hypertensive group, and the difference in the rates was not statistically significant.

Prematurity

In present study, prematurity was observed in 29%. Previously described rates of preterm labor are 45% (Campanharo et al), 38% (Huisman et al), 26.3% (Martins et al) and a much lesser 12.8% noted by Hink et al. The occurrence of prematurity was similar in the hypertensive group (33%) and the non-hypertensive group (28%).

IUGR

In present study, there was a 27.3% occurrence of small-for-gestational-age in the newborns. The small-for-gestational age was much higher in the hypertensive group (44.4%) than in the normotensive group (25%). The occurrence of the same has been reported to be 10% by Martins et al, 12.8% by Hink et al and 44% by Campanharo et al. Jatavan et al found a 2-fold increased risk of small-for-gestational among patients with cardiac disease when compared to those without.²⁰

Pulmonary hypertension

Pulmonary hypertension was seen in 10.4% of our patients, and the occurrence was similar in both the hypertensive and non-hypertensive groups. Siu et al observed a much lesser 4% occurrence.²¹ Pulmonary hypertension is an important factor which can precipitate

heart failure in the pregnant woman with cardiac disease.²²

Cardiac intervention

Thirty eight percent had undergone a cardiac intervention at least once, either during pregnancy or prior to pregnancy. The proportion was higher in the non-hypertensive group (44.2%) as compared to the hypertensive group (25%). Siu et al reported that 46% of the patients had undergone atleast one cardiac intervention ever.

Heart failure/ICU admissions

The rate of ICU admissions due to heart failure in present study was 51%. In western literature the 83% admission rate to ICUs as reported by Huisman et al probably reflect a higher availability of ICU facilities, when compared to the Indian context. Li et al reported a 30% rate of ICU admission.²³ The rate of ICU admission due to heart failure was significantly higher in the hypertensive group. Ruys et al have reported that preeclampsia was significantly associated with occurrence of heart failure in patients with cardiac disease.²⁴

Maternal death rates

As it is widely documented, cardiac disease continues to be a pre-eminent cause for indirect maternal mortality. In present study, we found 6.2% maternal death rate, and more importantly, authors found a significantly higher rate among those who were hypertensive. The study by Campanharo et al showed a 4.8% rate of maternal death in cardiac patients with hypertension. In the study by Subbiah et al, a 1% maternal death rate was noted.

Impact of hypertension on outcome in cardiac disease

Apart from present study, despite a complete literature search, it is found that no studies have specifically assessed the impact of hypertension on the outcomes in cardiac disease. Campanharo et al studied the impact of cardiac disease during pregnancy, on adverse maternal outcomes including Near miss mortalities. In this, the associated factors were studied. Among other conditions, hypertension was identified as one of the factors which contributed to potentially life-threatening situations in patients with pre-existing cardiac disease. To sum up, the rates of induction of labor, occurrence of IUGR, rate of ICU admissions due to heart failure and rates of maternal deaths are much higher among pregnant women with coexisting cardiac disease and hypertension, when compared to pregnant cardiac women who are non-hypertensive.

CONCLUSION

Present study suggests that presence of hypertension definitely worsens outcomes among patients with cardiac

disease. Hypertension should be thoroughly looked for and identified in patients with cardiac disease meticulously. The coexistence of the two should alert the obstetrician and specialist physician towards a more vigilant management. Stratifying risks and estimating maternal and fetal morbidity among patients with cardiac patients involves many factors, out of which hypertension is significant. The findings of this study may help risk stratification while counselling patients and patients' relatives better.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Mocumbi AO, Sliwa K, Soma-Pillay P. Medical disease as a cause of maternal mortality: the pre-imminence of cardiovascular pathology. *Cardiovasc J Afr.* 2016;27(2):84-8.
- Konar H, Chaudhuri S. Pregnancy complicated by maternal heart disease: a review of 281 women. *J Obstet Gynaecol India.* 2012; 62(3):301-6.
- Ng AT, Duan L, Win T, Spencer HT, Lee M-S. Maternal and fetal outcomes in pregnant women with heart failure. *Heart [Internet].* 2018. Available at <http://www.ncbi.nlm.nih.gov/pubmed/>
- Abul-Fadl A, Mourad M, Ghamrawy A, Sarhan A. Trends in Deaths from Rheumatic Heart Disease in the Eastern Mediterranean Region: Burden and Challenges. *J Cardiovasc Dev Dis.* 2018;5(2):32.
- Hayward RM, Foster E, Tseng ZH. Maternal and Fetal Outcomes of Admission for Delivery in Women with Congenital Heart Disease. *JAMA Cardiol.* 2017;2(6):664.
- Scantlebury DC, Kattah AG, Weissgerber TL, Agarwal S, Mielke MM, Weaver AL, et al. Impact of a History of Hypertension in Pregnancy on Later Diagnosis of Atrial Fibrillation. *J Am Heart Assoc.* 2018;7(10):e007584
- Duhig K, Vandermon B, Shennan A. Recent advances in the diagnosis and management of pre-eclampsia. *F1000 Research.* 2018;7:242.
- Sutton ALM, Harper LM, Tita ATN. Hypertensive Disorders in Pregnancy. *Obstet Gynecol Clin North Am.* 2018;45(2):333-47.
- Hypertensive disorders. In Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BS, editors. *Williams' Obstetrics.* 24th ed. Mc Graw hill 2014. New York.748.
- Huisman CM, Zwart JJ, Roos-Hesselink JW, Duvekot JJ, van Roosmalen J. Incidence and predictors of maternal cardiovascular mortality and severe morbidity in The Netherlands: a prospective cohort study. *PLoS One [Internet].* 2013;8(2):e56494.
- Roos-Hesselink JW, Ruys TPE, Stein JJ, Thilen U, Webb GD, Niwa K, et al. Outcome of pregnancy in patients with structural or ischaemic heart disease: results of a registry of the European Society of Cardiology. *Eur Heart J.* 2013;34(9):657-65.
- Hink E, Bolte AC. Pregnancy outcomes in women with heart disease: Experience of a tertiary center in the Netherlands. *Pregnancy Hypertens. An Int J Women's Cardiovasc Heal.* 2015;5(2):165-70.
- Martins LC, Freire CMV, Capuruçu CAB, Nunes M do CP, Rezende CA de L. Risk Prediction of Cardiovascular Complications in Pregnant Women with Heart Disease. *Arq Bras Cardiol.* 2016; 106(4):289-96
- Chumpathong S, Sirithaweesit C, Pechpaisit N, Suraseranivongse S, von Bormann B, Titapant V, et al. Predictors for complications in pregnant women with heart disease, a retrospective study. *J Med Assoc Thai.* 2014;97(7):730-5.
- Stangl V, Schad J, Gossing G, Borges A, Baumann G, Stangl K. Maternal heart disease and pregnancy outcome: A single-centre experience. *Eur J Heart Fail.* 2008;10(9):855-60.
- Subbaiah M, Sharma V, Kumar S, Rajeshwari S, Kothari SS, Roy KK et al. Heart disease in pregnancy: cardiac and obstetric outcomes. *Arch Gynecol Obstet.* 2013;288(1):23-7.
- Avila WS, Rossi EG, Ramires JAF, Grinberg M, Bortolotto MRL, Zugaib M, et al. Pregnancy in patients with heart disease: experience with 1,000 cases. *Clin Cardiol.* 2003;26(3):135-42.
- Campanharo FF, Cecatti JG, Haddad SM, Parpinelli MA, Born D, Costa ML, et al. The Impact of Cardiac Diseases during Pregnancy on Severe Maternal Morbidity and Mortality in Brazil. *PLoS One [Internet].* 2015;10(12):e0144385.
- Josefsson A, Kernell K, Nielsen NW, Bladh M, Sydsjö G. Reproductive patterns and pregnancy outcomes in women with congenital heart disease - a swedish population-based study. *Acta Obstet Gynecol Scand.* 2011;90(6):659-65.
- Jatavan T, Luewan S, Tongsong T. Outcomes of pregnancy complicated by heart disease at Maharaj Nakorn Chiang Mai Hospital. *J Med Assoc Thai.* 2011;94(10):1159-63.
- Siu SC, Sermer M, Colman JM, Alvarez N, Mercier L, Morton BC et al. Prospective multicenter study of pregnancy outcomes in women with heart disease. *Circulation.* 2001;104(5):515-21.
- Fu Q, Lin J. Risk factors for heart failure during pregnancy among Chinese women with cardiac disease. *Int J Gynecol Obstet.* 2015;130(3):266-9.
- Li M, Yao Q, Xing A. A clinical analysis of 188 cases of pregnancy complicated with critically heart disease. *J Central South Uni Med Sci.* 2014;39(11):1145-50.
- Ruys TPE, Roos-Hesselink JW, Hall R, Subirana-Domènech MT, Grando-Ting J, Estensen M, et al. Heart failure in pregnant women with cardiac disease: data from the ROPAC. *Heart.* 2014;100(3):231-8.

Cite this article as: Gupta K, Shetty A, Prasad M, Gupta AS. Clinical outcomes among pregnant patients with cardiac disease only and those with co-existing pregnancy-associated hypertension. *Int J Reprod Contracept Obstet Gynecol* 2018;7:3288-93.