

Study of risk factors in pregnant women with heart failure in a tertiary care hospital and its maternal outcome

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ABSTRACT

Objectives: The aim of our study was to assess the risk factors and maternal outcome in pregnant women with heart failure. **Method:** It was an observational study conducted at Silchar Medical College, Silchar from June 1st of 2019 to May 31st of 2020. 70 patients were studied. The diagnosis was made according to Framingham's criteria and grading was done according to NYHA class. **Results:** The rate of heart failure per 10,000 deliveries in our study was 64.77. Majority (45.7%) of the antenatal patients admitted with heart failure were in age group 20-24 years and most of them presented ≥ 37 weeks (60%) in peripartum period. Majority (52.9%) were primigravida, and 74.3% were referred from other centres. Only 12.9 % of patients had pre-existing heart disease. 45.7% of patients had anaemia as risk factor followed by eclampsia or pre-eclampsia. About 40% of the patients were delivered by LSCS. The maternal mortality was found to be 21.4%. Preterm delivery, prolonged hospital stay (≥ 7 days), admission in ICU, mechanical ventilation and disseminated intravascular coagulation (DIC) were other adverse maternal outcomes. Most of the expired patients were in NYHA grade IV. **Conclusion:** Heart failure in antenatal patients may lead to severe mortality and morbidity. Identification of risk factor and prompt initiation of treatment will help in reducing disastrous results.

Keywords: Anemic heart failure, eclampsia, Framingham's criteria, NYH.

A tertiary care hospital usually has a huge turnover of antenatal patients and heart failure (HF) during pregnancy may lead to significant maternal mortality. The focus of most of the studies of HF has been the older populations. Therefore, little information is available regarding HF-related risk factors among the reproductive age group and the antenatal patients in the Indian scenario.

Heart failure is defined by the European Society of Cardiology (ESC) as 'a clinical syndrome characterized by symptoms such as shortness of breath, persistent coughing or wheezing, ankle swelling and fatigue that may be accompanied by the following signs: jugular venous pressure, pulmonary crackles, increased heart rate and peripheral edema.'¹ Pregnancy is a physiological stress that unveils many quiescent medical condition. There is increase in cardiac output, approximately 40% during pregnancy²,

which may trigger heart failure. Labour and delivery are particularly considered as high risk factors because pain, uterine contractions, bleeding etc put a toll on cardiac functions and cause further increase in cardiac output. The prevalence of HF during the antepartum period may be attributable to pre-existing cardiovascular risk factors such as valvular disease, congenital heart disease, hypertension and diabetes mellitus etc. or may be due to peripartum cardiomyopathy which is defined as idiopathic heart failure (HF) occurring in the absence of any determinable heart disease in the last month of pregnancy or during the first 5 months postpartum.³ Anemia and other pregnancy related conditions, including preeclampsia and eclampsia, are also associated with cardiac failure.⁴

McKee and colleagues described Framingham's criteria for CHF in 1971. Major criteria include acute pulmonary

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edema, cardiomegaly, hepatojugular reflux, neck vein distension, paroxysmal nocturnal dyspnea or orthopnea, pulmonary rales, third heart sound (S₃ gallop) and weight loss >4.5 kg in 5 days in response to treatment. Minor criteria include bilateral ankle edema, dyspnea on exertion, hepatomegaly, nocturnal cough, pleural effusion, decrease in vital capacity by 1/3rd from maximum recorded and tachycardia (HR >120). For establishment of diagnosis of heart failure, 2 major criteria or 1 major criterion and 2 minor criteria are required.⁵

New York Heart Association Classification is used to grade degrees of exertional dyspnea. Class I implies that ordinary physical activity does not cause undue fatigue, palpitations, dyspnea, or anginal pain. Class II signifies ordinary physical activity causing symptoms; class III is designated when less than ordinary activity leads to symptoms. Class IV denotes that symptoms of heart failure or the anginal syndrome may be present even at rest.⁶

Methods

Our study is an observational study carried out at Dept of Obstetrics and Gynecology, Silchar Medical College and Hospital over a period of 1 year from 1st June, 2019 to 31st May, 2020. All pregnant women with gestational age ≥ 28 weeks and singleton pregnancy admitted at SMCH with heart failure or developing heart failure during the course of stay were included in the study.

The study has been approved by members of the ethical committee, Silchar Medical College & Hospital, Silchar in the meeting held on January 10th, 2019.

Informed consent from patients was taken and data was collected according to a specially designed case recording performa (CRF) concerning patient’s particulars, proper history, clinical examinations, investigations and diagnostic procedures among the antenatal patients admitted with heart failure during the study period, and were screened for eligibility criteria. A total of 70 cases were studied. Diagnosis was made according to Framingham’s criteria. In pregnant women, it becomes difficult to elicit hepatojugular reflex and to assess hepatomegaly clinically. Vital capacity also could not be assessed. Hence other clinical parameters were focused upon more.

The risk factor particular to each patient was studied. The mode of delivery whether vaginal, assisted or cesarean section was duly recorded. Maternal outcome was observed.

The study subjects were investigated for and analysis was done in the form of percentages and proportions and represented as tables where necessary. Association between

two categorical variables was measured using chi-square test or fisher test. P value of less than 0.05 was considered significant.

Results

The total number of deliveries during our study period was 10806, out of which 70 patients developed heart failure. So the incidence per 10,000 deliveries was 64.77. Majority (45.7%) of the antenatal patients admitted with heart failure were in age group 20-24 years. Most of the patients developing heart failure (60%) presented ≥37 weeks in peripartum period and majority of the patients (52.9%) were primigravida. About 74.3% were referred from other centres and only 12.9% patients had pre-existing heart disease (table 1).

Table 1: Distribution of patients with heart failure according to age, period of gestation, gravida, status of referral and presence of pre-existing heart disease

Age (in years)	No. of patients	Percentage (%)
16-19	8	11.4
20-24	32	45.7
25-29	14	20.0
30-34	12	17.1
>34	4	5.7
Total	70	100.0
Period of gestation		
28-32 weeks	16	22.9
33-36 weeks	12	17.1
>= 37 weeks	42	60.0
Total	70	100.0
Gravida		
Gravida 1	37	52.9
Gravida 2	16	22.9
Gravida ≥3	17	24.2
Total	70	100.0
Status of referral		
Referred	52	74.3
Not referred	18	25.7
Total	70	100.0
Pre-existing heart disease		
Yes	9	12.9
No	61	87.1
Total	100	100.0

The incidence of operative and instrumental delivery has been found to be very high (40% by lower segment cesarean section and 21.4% by instrumental delivery). 8.6% expired without delivering (table 2).

Table 2: Distribution of patients with heart failure according to mode of delivery

Mode of delivery	No. of patients	Percentage
Spontaneous vaginal delivery (SVD)	21	30.0
Lower segment caesarean section (LSCS)	28	40.0
Instrumental delivery (ID)	15	21.4
Undelivered	6	8.6
Total	70	100.0

Adverse outcome included preterm delivery, postpartum hemorrhage or PPH, prolonged hospital stay ≥7 days, ICU admission, mechanical ventilation and disseminated

intravascular coagulation (DIC). Maternal mortality was found to be very high, about 21.4% (table 3).

Table 3: Distribution of patients with heart failure according to maternal outcome

Maternal outcome	No. of patients (N=70)	Percentage
Maternal mortality	15	21.4
Preterm delivery	22	31.4
Postpartum hemorrhage (PPH)	4	5.7
Prolonged hospital stay (≥7 days)	42	60.0
ICU admission	53	75.7
Mechanical ventilation	13	18.6
Disseminated intravascular coagulation (DIC)	1	1.4

Table 4: Distribution of patients with heart failure according to possible risk factors

Risk factors	Total patient	Mortality		P value		
		Yes (N=15)	No (N=55)			
		No. of patient	%	No. of patient	%	
Anaemia	32	5	33.3%	27	49.1%	0.214
Anaemia + GH	8	4	26.6%	4	7.2%	0.383
Eclampsia	13	3	20.0%	10	18.2%	0.058
ASD + PAH	1	1	6.7%	0	0%	1.000
MS	1	1	6.7%	0	0%	0.214
AFE	1	1	6.7%	0	0%	0.214
Other factors	14	0	0.0%	14	25.5%	0.030
- Pre-eclampsia	5					
- PPCM	2					
- HOCM	1					
- DCM	2					
- Regurgitant lesions	2					
- ASD unassociated with PAH	2					

GH - Gestational hypertension; ASD - Atrial septal defect; PAH - Pulmonary artery hypertension; MS - Mitral stenosis; AFE - Amniotic fluid embolism; PPCM - Peripartum cardiomyopathy; HOCM - Hypertrophic obstructive cardiomyopathy; DCM - Dilated cardiomyopathy.

Majority of antenatal patients had anemic heart failure followed by eclampsia and pre-eclampsia. Among other causes, ASD with PAH, amniotic fluid embolism, Mitral stenosis led to heart failure and mortality. Peripartum cardiomyopathy (PPCM), dilated cardiomyopathy (DCM),

Table 5: Distribution of patients with heart failure according to NYHA grade

NYHA class	Mortality		P value	
	Yes	No		
	No. of patients	%	No. of patients	%
Grade 2	0	0%	34	61.8%
Grade 3	1	6.7%	18	32.7%
Grade 4	14	93.3%	3	5.5%
Total	15	100.0%	55	100.0%

hypertrophic obstructive cardiomyopathy (HOCM), pre-eclampsia, regurgitant lesions, atrial septal defect (ASD) unassociated with pulmonary artery hypertension (PAH) showed no mortality. This was found to be statistically significant (table 4).

NYHA grade: 6.7% of expired patients belonged to NYHA grade III and 93.3% of expired patients belonged to NYHA grade IV. This was also found to be significant statistically (table 5).

Discussion

Heart failure in pregnant women requires urgent diagnosis and prompt management through participation of both cardiologists and obstetricians in order to provide safe motherhood⁷. Studies have been carried out in USA, UK and other countries in relation to heart failure in antenatal patients. However, the risk factors leading to cardiac failure and resulting mortality in India differ considerably due to different socioeconomic conditions and inadequate referral at appropriate time.

The rate of heart failure per 10,000 deliveries in our study was 64.77.

Mulubhran F Mogos⁴ et al observed that the overall rate of HF was 112 cases per 100 000 pregnancy related hospitalizations in United States. However no concrete data regarding prevalence of heart failure in the Indian scenario is

available.

The most common age group of antenatal patients presenting with heart failure was found to be 20-24 years (45.7%) followed by 25-29 years (20%) and then by 30-34 years (17.1%). In a similar study on heart failure, Mulubhran F Mogos⁴ et al found 15.4% patients in the age group 20-24 years and highest distribution 27.1% in the age group 30-34 years. This disparity between India and USA is chiefly because of earlier age of marriage in rural India, and more prevalence of anemia and eclampsia in the younger age group, which mostly lead to heart failure in India. In a study by Saima Salam⁸ et al, the maximum number of patients was in 20-30 year age group (74.5%), in our study the percentage of patients being 65.71% in that age group.

Most of the patients developing heart failure (60%) presented ≥37weeks in peripartum period, 22.9% at the beginning of 3rd trimester i.e 28-32 weeks and the rest 17.1% during 32-36 weeks. Anita Deborah Anwar⁹ et al found out that most of the subjects suffered from heart failure during the third trimester of pregnancy. Titia P E Ruys¹⁰ et al

observed that HF occurred at a median time of 31 weeks gestation with the highest incidence at the end of the second trimester (34%) or peripartum (31%). In their study too, there appeared to be two peaks, the first peak being at end of the second and beginning of the third trimester, corresponding to 23 - 30 weeks, when most of the important haemodynamic changes have taken place, stroke volume has attained its maximum of up to 130% of normal, but heart rate is yet to increase. The second peak occurred around delivery, corresponding to peripartum haemodynamic changes, when the physiological demands and adjustments of labor, birth and anxiety place undue burden on compromised cardiac function.⁴

54.28% of the patients were found to be primigravida. Around 24.2% were of gravid 3 or higher order. Titia PE Ruys¹⁰ et al found 51% of heart failure in nulliparous women. Saima Salam⁸ et al observed that in pregnancies complicated by cardiac events, most of them were either primigravidae or primipara (60%). It has been seen that 74.3% of patients who developed heart failure were referred from peripheral institutions while 25.7% presented directly at our hospital. Late referral is one of the main causes for anemic and eclampsia patients presenting with cardiac failure at our institution.

In our study it is seen that 12.9 % of patients presented with pre-existing heart disease. Anita Deborah Anwar⁹ observed that 20% of patients in NYHA grade III-IV and 26.9% in NYHA grade I-II had history of pre-existing heart disease. In our study, most of the patients had either anemia or eclampsia as a risk factor for heart failure; hence the incidence of pre-existing heart disease was comparatively less.

In our study, the incidence of operative and instrumental delivery has been found to be high where 40% patients delivered by lower segment cesarean section (LSCS), 30% by spontaneous vaginal delivery (SVD), 21.4% by instrumental delivery (ID) and 8.6% expired without delivering. Mulubrhan F Mogos⁴ et al observed that 71.78% of patients delivered by LSCS while Titia PE Ruys¹⁰ et al observed that 58% of patients delivered by LSCS. Anita Deborah Anwar⁹ et al observed that 72.1% of patients in NYHA grade I-II delivered by LSCS and 20.8% by instrumental delivery. In NYHA grade III-IV, 77.2% delivered by cesarean section and 15.9% by instrumental delivery. The increased incidence of operative delivery in our study was partly due to obstetric indication (post cesarean pregnancy, malpresentation) and partly due to

cardiac causes and unfavourable cervix in patients with eclampsia. Instrumental delivery was used in favour of cutting short the second stage of labour. The decision of mode of delivery is generally dictated by the parity, obstetric indications and severity of cardiac decompensation of the particular individual. However, there is no rationale for routine caesarean delivery in women with heart failure.⁷ Clinical course of the disease and maternal condition should dictate whether induction of labour is necessary but it should ideally be delayed beyond week 37 unless there is immediate danger to the life of the mother. In pregnant women with refractory heart failure, early delivery with a cesarean section may be essential.⁸

In our study, 34.3% of patients had preterm delivery, 5.7% had postpartum hemorrhage (PPH), 60% had prolonged hospital stay (≥ 7 days), 75.7% patients were admitted in ICU, 18.6% were mechanically ventilated and 1.4% developed disseminated intravascular coagulation (DIC). Mulubrhan F Mogos⁴ et al observed 5.3% had postpartum hemorrhage (PPH), 58.91% had prolonged hospital stay, 13.76% were mechanically ventilated and 3.9% developed disseminated intravascular coagulation (DIC).

Anita Deborah Anwar⁹ et al observed that in NYHA grade III-IV, the maternal mortality rate is 15.9%. It was also observed that in NYHA grade III-IV, 52.5% of patients had prolonged hospital stay (≥ 7 days) and in NYHA grade I-II, 33.5% had prolonged hospital stay (≥ 7 days). 89.7% were admitted in the intermediate care unit and 10.3% in the intensive care unit with NYHA grade III-IV. In NYHA grade I-II, 82.3% required admission in the intermediate care unit, 3% in the intensive care unit and only 14.7% were treated in a normal room. In our setting there is no availability of an intermediate care room, so most patients were treated in the intensive care unit. Women with HF were often delivered preterm in our study to cut down the period of volume overload and to commence appropriate therapy for HF.

The higher maternal mortality in our study due to cardiac failure may be attributed to a plethora of factors, the chief reason being late presentation at hospital, late referral, lack of awareness, increased incidence of anemia and eclampsia in rural areas etc.

Majority of antenatal patients (45.7%) had anemic heart failure followed by eclampsia and pre-eclampsia. Co-existence of anemia and gestational hypertension or preeclampsia resulted in high mortality. Among other causes, ASD with PAH, amniotic fluid embolism, mitral stenosis led

to heart failure and mortality. No death was reported in cases of peripartum cardiomyopathy (PPCM), Dilated cardiomyopathy (DCM), hypertrophic obstructive cardiomyopathy (HOCM), pre-eclampsia, regurgitant lesions, atrial septal defect (ASD) unassociated with pulmonary artery hypertension (PAH).

Anita Deborah Anwar⁹ et al observed that 26.4% in NYHA grade I-II had severe pre-eclampsia and 40.69% in NYHA grade III-IV presented with severe preeclampsia while Sharmin Abbasi¹¹ et al observed that majority of cases associated with anemia (47.1%) followed by preeclampsia (21.6%) worsened the underlying cardiac lesion during pregnancy. Mulubrhan F Mogos⁴ et al observed that 23% of antepartum hospitalizations with heart failure were anemic and 24.2% had H/O chronic blood loss. 28.7% of patients were found to have pre-eclampsia. In their study, it was found that the chief risk factor was cardiomyopathy. Our country being a developing country, there is disparity in possible risk factors leading to cardiac failure. The most important cause leading to heart failure in our study is anemia followed by pre-eclampsia/eclampsia followed by heart diseases. Illiteracy, undernutrition, poor socioeconomic background, underutilization of health services, lack of awareness are some of the factors leading to such drastic consequences. Mostly tea garden labourers with low socioeconomic status from rural area were found to be prone to anemic heart failure due to under-nutritious diet, increased tea intake (tannins and oxalates inhibiting iron absorption), worm infestations etc. Most of the patients being daily wage labourer, they had to earn a living even during pregnancy. They preferred to work than to get regular antenatal check-ups. Hence, the anemia remained undiagnosed unless it was very severe, presenting as heart failure.

It is of paramount importance to identify the women at increased risk of developing HF, so that early intervention and adequate monitoring may be initiated.⁴ The delivery of antenatal patients with cardiac failure should ideally be conducted in a well equipped centre with ICU/NICU facilities with a multi-disciplinary team of obstetricians, cardiologists, anaesthesiologists, pediatricians. A detailed plan should be developed, including labor and delivery.⁸ The study was a hospital based study with a small sample size of only 70 cases. Hence, to extract more detailed information regarding Heart Failure in antenatal patients, a multicenter broader study covering a larger number of patients over a longer time period is required.

Conclusion

From our study, it is seen that heart failure in antenatal patients is a significant cause of mortality and morbidity. Anemia, gestational hypertension and eclampsia being the chief causes of heart failure, it may be concluded that proper antenatal checkup is imperative to prevent and address these issues. Antenatal patients with heart disease should be dealt with by a multidisciplinary team in a properly equipped hospital. Proper utilization of health services, timely referral are some of the measures that may be undertaken to prevent heart failure and prevent drastic consequences.

Conflict of interest: None. **Disclaimer:** Nil.

References

1. Lainscak M, Spoletini I, Coats A. Definition and classification of heart failure. *International cardiovascular forum journal*. 2017;10: 3-7.
2. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr*. 2016; 27(2): 89-94.
3. Demakis JG, Rahimtoola SH. Peripartum cardiomyopathy. *Circulation*. 1971; 44(5): 964 - 8.
4. Mogos MF, Piano MR, McFarlin BL, Salemi JL, Liese KL, Briller JE. Heart Failure in Pregnant Women: A Concern Across the Pregnancy Continuum. *Circ Heart Fail*. 2018; 11(1): e004005.
5. Löfström U, Hage C, Savarese G, Donal E, Daubert JC, Lund LH, et al. Prognostic impact of Framingham heart failure criteria in heart failure with preserved ejection fraction. *ESC Heart Failure*. 2019; 6(4): 830 - 39.
6. Mann DL, Chakinala M. Heart Failure: Pathophysiology and Diagnosis. Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, Editors. *Harrison's principle of internal medicine*. 20th edition. United States of America: McGraw-Hill Education; 2018. p. 1763-69.
7. Anthony J, Sliwa K. Decompensated Heart Failure in Pregnancy. *Card Fail Rev*. 2016; 2(1): 20-6.
8. Salam S, Mushtaq S, Md-ud-Din K, Gul I, Ali A. Maternal and fetal outcome in pregnancy with heart disease in tertiary care hospital in India. *Int J Reprod Contracept Obstet Gynecol*. 2017 Sep; 6(9): 3947-51.
9. Anwar AD, Winarno GNA, Anggraeni EN. Correlation Between Risk or Severity of Heart Failure and Outcome of Pregnancy. *Int J Gen Med*. 2020;13:201-6.
10. Ruys TP, 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): 231-38.
11. Abbasi S, Siddiqua S, Rijvi S, Akhtar S, Haque B, Jesmin S. Study of Maternal and Fetal Outcome in Pregnancy with Heart Disease. *Anwer Khan Modern Medical College Journal*. 2017; 8(2): 112-16.
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