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Full Length research Paper

Peripartum cardiomyopathy: risk factors, hospital course and prognosis; experiences at Lady Reading Hospital Peshawar

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To study the so-called risk factors associated with peripartum cardiomyopathy, its hospital course, short and long term mortality and outcome of subsequent pregnancies. A total of 61 patients diagnosed with peripartum cardiomyopathy were enrolled in the study. Data regarding risk factors, presenting complaints, complications, pregnancy outcomes, therapeutics used and outcome at 3, 6 and 12 months were recorded. The incidence was estimated to be 1 per 933 deliveries. Mean age ±SD was 30.94±6.63 years. Majority of patients 33(54.1%) were obese. The mean parity was 3.66 ±1.41. Other risk factors were chronic hypertension 19 (31.1%), pre-eclampsia 12 (19.7%), multiple pregnancies 5(8.2%), long term tocolysis 13 (21.3%) and anemia 21(34.4%). Forty-three patients 43(70.5%) presented in post partum period while 18 (29.5%) in atepartum period. Majority of patients presented with dyspnea and were in NYHA class lll 18(29.5%) &IV 35(57.5%). Main ECG findings were sinus tachycardia 39 (63.9%), LV hypertrophy 42 (68.9%), T wave inversion 28(45.9%) and Poor R wave progression in precordial leads with Q waves 40(65.6%). Ejection fraction was universally reduced. Other echocardiograpic findings included chamber dilation 48(78.7%), moderate to severe mitral regurgitation 15(24.6%), left ventricular thrombus 12 (19.7%) and pulmonary artery hypertension 15(24.6%). Thirty-six women 36(59%) had normal vaginal delivery, 12(19.7%) had assisted vaginal delivery and 13(21.3%) required caesarean section. There were 50(82%) live births and 11(18%) perinatal deaths. The main complications were pulmonary edema 7(11.5%), cardiogenic shock 8(13.1%) and thromboembolism 13(21.3%). At hospital discharge, 9 (14.8%) patients were dead and 52(85.2%) were discharged with stable heart failure. Major therapeutics used was various drugs used in the treatment of heart failure and specialized therapies including implantable cardiac defibrillator (ICD) 5(8.2%)), cardiac resynchronization therapy (CRT) 3(4.9%)) and cardiac transplantation or left ventricular assist device 8(13.1%)). At the last follow up at month 12, total of 20(32.8%)) were dead while 32(52.5%)) had recovered fully and 9(14.75%)) were still suffering from heart failure. During follow up, only 8 (19.5) pregnancies were detected. Five 5(62.5) patients had uneventful course while two 3(37.5) developed heart failure again. Peripartum cardiomyopathy is associated with multiple risk factors and carries high morbidity and mortality.

Keywords: Peripartum cardiomyopathy, Risk factors**,** Hospital course, Prognosis.

INTRODUCTION

Peripartum cardiomyopathy (PPCM) is a rare life threatening cardiomyopathy of unknown cause that occurs in the peripartum period in previously healthy women (Pearson et al., 2000). It has been variably defined. The criteria for its diagnosis were first established by Demakis et al. in 1971 (Demakis et al., 1971; Sliwa et al., 2012). Later on the National Heart,

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Lung, and Blood Institute and the Office of Rare Diseases workshop adopted the modified definition in 2000 (Pearson et al., 2000). In 2010, the European Society of Cardiology Working Group on Peripartum Cardiomyopathy proposed a modification to the existing definition of PPCM (Hasan et al., 2010). According to the first two definitions it must develop during the last month of pregnancy or within 5 months of delivery in absence of preexisting heart diseases with evidence of left ventricular dysfunction (i.e., left ventricular ejection fraction <45% on echocardiography) and no other identifiable cause responsible for heart failure. Its incidence is quoted as 1: 3500 to 1: 1400 for the USA and Europe, 1: 1000 for South Africa and 1 in 299 for Haiti (Sakakibara et al., 1970) (8) In Pakistan its incidence is estimated to be 1 in 837 deliveries in one study (Gouley et al., 1937).

A relationship between pregnancy and dilated cardiomyopathy was first noted in 1870 when Virchow and Porak first reported autopsy evidence of myocardial degeneration in patients who died in the puerperium (Gouley et al., 1937). In 1937 Gouley et al. described the clinical and pathologic features of seven pregnant patients who had severe and often fatal heart failure. Four of the seven patients died; the autopsy demonstrated enlarged hearts with widespread severe focal areas of necrosis and fibrosis. These findings were atypical compared with those of other patients with myocardial failure. Therefore the authors proposed that this heart failure was related to pregnancy and the puerperium either directly or indirectly (Heider et al., 1999).

Risk factors for PPCM classically identified in the literature include multiparity, advanced maternal age, multifetal pregnancy, preeclampsia and gestational hypertension, obesity, malnutrition and African American race ((Demakis et al., 1971; Ansari et al., 2002) A number of possible causes have been proposed for PPCM including myocarditis, abnormal immune response to pregnancy, maladaptive response to the hemodynamic stresses of pregnancy, stress-activated cytokines, cardiotropic viruses, micronutrient or trace mineral deficiencies , genetics and prolonged tocolysis (Pearson et al., 2000; Pierce, 1962, Massad et al., 1993; Pearl, 1995; Pyatt and Dubey, 2011; O'Connell et al., 1987). Recent evidence suggests a role for a 16 kDa prolactin derivative produced by proteolytic cleavage of prolactin secondary to unbalanced oxidative stress present during late pregnancy and early puerperium (Lee, 1991).

Patients with peripartum cardiomyopathy present with typical symptoms and signs of heart failure. The majority of cases occur after delivery and in the immediate post partum period. The diagnosis requires echocardiograpic information and rests on the presence of left ventricular systolic impairment. Medical treatment of peripartum cardiomyopathy is similar to treatment of congestive heart failure. Immunosuppressive therapy can be considered for women with myocarditis. Maternal mortality from peripartum cardiomyopathy in United States has been reported to be 25-50%.[16,17] Normalization of heart size and resolution of congestive heart failure within 6 months after delivery is a good prognostic sign with mortality rare among these patients (Ansari et al., 2002).

Patients with peripartum cardiomyopathy require counseling concerning the risk of a subsequent pregnancy. Patients without resolution of their cardiomyopathy are at significant risk for death or exacerbation of the disease and should be advised to avoid pregnancy (Ansari et al., 2002). However a few studies Suggested that 20% of patients experienced transient exacerbation during subsequent pregnancy even after complete resolution of cardiac dysfunction (Fett et al., 2005).

Peripartum cardiomyopathy is a rare lethal disease about which little is known (Pearson et al., 2000). It is especially true at our provincial and national level where data about it are limited. The aim of this paper was to assess the incidence, risk factors, hospital course and outcome of peripartum cardiomyopathy in our set up.

MATERIALS AND METHODS

This descriptive study was conducted from January 1st 2008 to Dec 30th 2011 in the department of cardiology, postgraduate medical institute, govt lady Reading hospital Peshawar. Hospital ethical committee approved study protocol. Peripartum cardiomyopathy was diagnosed as given in the introduction. The mortality rate mentioned in one study is 25-50%.[54] Using World Health Organization table for sample size determination with confidence level of 95%, margin of error 10% and the above response distribution, sample size of 100 to 225 patients is needed. However due the rare nature of the disease we collect only 61 patients. Patients of any age fulfilling the above diagnostic criteria were enrolled in the study. Patients with previous history of cardiac disease including valvular heart disease, congenital heart diseases, cardiomyopathies of any cause and pulmonary artery hypertension either primary or secondary, cardiac failure due to severe preeclampsia, fluid overload and amniotic fluid embolism were excluded. Patients with normal echocardiograpic findings were also excluded from the study. Informed written consent was obtained from each patient. Permanent residential address and telephone number was obtained from every patients to ensure effective follow up. Every patient is given a computer ID to ensure data retrieval.

During evaluation of patients, risk factors responsible for PPCM including age, race, parity, twin pregnancy, obesity, chronic hypertension, preeclampsia and malnutrition were noted. Chronic hypertension was taken as elevated blood pressure of > 140/90 mm of Hg on

three occasions and pre-eclampsia as blood pressure of > 140/90 with proteinuria after 20 weeks of pregnancy. Obesity was defined as Body Mass Index (BMI) of > 30. Considering an average weight gain of 8-12 Kg in pregnancy with no idea in most of the patients of pre-pregnancy weight, BMI was taken as estimates of obesity in the study patients.

Presenting clinical features including atepartum or postpartum status, dyspnea, cough, haemptysis and fatigue were noted. ECG features like sinus tachycardia, left ventricular hypertrophy, repolarization changes, premature ventricular contractions, T wave inversion, low voltage QRS and left bundle branch block were recorded. Echocardiograpic features like chamber dilation, ejection fraction, mitral regurgitation, pulmonary artery hypertension and left ventricular thrombus were recorded. Chamber size was measured using two-dimensional (2-D) short axis view and applying M-Mode. Left ventricular diastolic dimension greater than 5.5 cm was taken as chamber dilation. Ejection Fraction was measured with Simpson's method and considered low when less than 45 and normal when greater than 55.

Patients were treated on standard lines for heart failure according to the current 2010 ESC guidelines for HF and monitored for complications including cardiogenic shock, pulmonary edema, thromboembolism, ventricular tachycardias, atrial fibrillation and cardiopulmonary arrest. Complications were managed on standard lines and need for ICU care was assessed. Candidacy for ICD, CRT, LV assist device and cardiac transplant was assessed using current european guidelines. Patients who died during hospitalization were recorded. Patients, once stabilized, were discharged on standard medical therapy and scheduled for follow up at 1, 3, 6 and 12 months. If patients needed rehospitalization she was admitted with same ID to ensure correct number of hospitalization. At the expected date of follow up, telephone reminder was given to patients or her relatives about follow up. AT follow up it was confirmed that patient is alive and her NYHA class was noted. ECG and echocardiography were performed and parameters noted. Recovery was assessed by improvement in functional class of dyspnea and ejection fraction on repeat echocardiogram.

During follow up particular attention was focused on the occurrence of subsequent pregnancies. Patients were followed for eighteen months and pregnancy screening was done with ß- HCG pregnancy test.

Operational Definitions

Ventricular Tachycardia

It was defined by the occurrence of a series of three or more consecutive premature ventricular complexes on ECG whose duration exceeds 120 ms with the ST–T vector pointing opposite the major QRS deflection.

Cardiac Arrest

It was defined by the presence of irregular undulations of varying contour and amplitude, without possible distinction of QRS complexes, ST segment or T waves in the presence of unrecordable carotid pulse and blood pressure.

Atrial Fibrillation

It is the Irregular interval between QRS Complexes with absent P wave in two or more leads on surface ECG.

Left Ventricular Hypertrophy

Any one the following criteria if positive were considered as LV hypertrophy. Sokolow-Lyon index: SV_1 + (RV_5 or RV_6) > 3.5 mV, RaVL > 1.1 mV.
Cornell voltage criteria: SV_3 + SaVL ≥ 2.0 mV.

Pulmonary Edema

It was defined as breathlessness (by asking from patient to be present at rest or 10 meters walking), bilateral chest crepitations, S3 gallop on auscultation and heart rate of >120 bpm.

Cardiogenic Shock

It was defined as systolic blood pressure of <90 mm Hg for more than one hour that is not responsive to intravenous normal saline administration and associated with signs of hypo perfusion i.e. cyanosis, cold extremities, changes in mental status (disoriented in time, place and person), persistent oliguria (urine output less than 400ml/24 h measured with Foley's catheter or condom catheter attached to urine bag).

Thromboembolism

Clinically manifested embolization of left ventricular thrombus to brain (focal neurological deficits), abdominal organs (abdominal pain and tenderness) and lower limbs (impalpable pulses) or pulmonary embolism (dyspnea, chest pain and CT angiography evidence of pulmonary emboli) from deep venous thrombosis.

Stastical Analysis

It was performed using statistical package for social sciences (SPSS) version 19.00. Numerical variables

Table 1. summarizing the so-called risk factors responsible for peripartum cardiomyopathies.

Characteristics	NO (%)	Mean±SD
Age(Years)		30.94±6.63
18-30	28(45.9)	
>30	33(54.1)	
White Race	43(70.5)	
Black Race	18(29.5)	
Parity		
1	3(4.9)	
2	9(14.8)	
≥3	49(80.3)	
Mean parity		3.66±1.41
Multiple Pregnancy	5(8.2)	
Chronic hypertension	19(31.1)	
Pre-eclampsia	12(19.7)	
Body weight (Kg)		73.5±6.91
Obesity	33(54.1)	
Anemia	21(34.4)	
Smoking	0	
Alcoholism	0	
Long-term Tocolysis	13(21.3)	

were presented as mean±SD and categorical variables as frequency and percentages. All the data were presented in the forms of tables.

RESULTS

A total of 61 patients were included in the study. The mean age was 30.94±6.63 years. Patients from 18-30 years were 28(45.9) while patients above 30 years were 33 (54.1%). Patients with white race were 43(70.5%) while patients with black race were 18(29.5%). Most of patients 33(54.1%) were obese with mean body weight of 73.5±6.91kg. The mean parity was 3.66 ±1.41. Majority 49(80.3%) had more than three children. Other risk factors were chronic hypertension 19 (31.1%), pre-eclampsia 12 (19.7%), multiple pregnancy 5(8.2%), long term tocolysis 13 (21.3%) and anemia 21(34.4%). The incidence was estimated to be 1 per 933 deliveries. These are summarized in table 1.

Forty-three patients 43(70.5%) presented in post partum period while 18 (29.5%) in atepartum period. Majority of patients presented with dyspnea and were in NYHA class III 18(29.5%) &IV 35(57.5%). Other presenting complaints were chest pain 36(59%), palpitation 27(44.3%), cough 27(44.3%) and fatigue 30(49.2%).Mean delay in diagnosis was 6.5±3.8 days. These are summarized in table 2.

Main ECG findings were sinus tachycardia 39 (63.9%), LV hypertrophy 42 (68.9%), T wave inversion 28(45.9%), Poor R wave progression in precordial leads with Q waves 40(65.6%), frequent premature ventricular contractions (PVCs) 13(21.3%) and left bundle branch block 9(14.8%). Mean ejection fraction was 29.29±10.06 and it was universally reduced. Other echocardiograpic findings included chamber dilation 48(78.7%), moderate to severe mitral regurgitation 15(24.6%), left ventricular thrombus 12(19.7%) and pulmonary artery hypertension 15(24.6%). These are summarized in table 3.

Thirty-six women 36(59%) had normal vaginal delivery, 12 (19.7%) had assisted vaginal delivery and 13(21.3%) required caesarean section. There were 50(82%) live births and 11(18%) perinatal deaths. These are summarized in table 2.

Hospital course was complicated in few patients. The main complications were pulmonary edema 7(11.5%), cardiogenic shock 8(13.1%), pericardial effusion 5(8.2%), thromboembolism 13(21.3%), ventricular tachycardias 8(13.1%), atrial fibrillation 8(13.1%) and cardiopulmonary arrest 5(8.2%). Twenty-three patients 23(37.7%) needed intensive care (ICU). Mean hospital stay was 6.62±2.31. At hospital discharge 9 (14.8%) were dead and 52(85.2%) were discharged with stable heart failure. These are summarized in table 4.

During hospitalization patients were treated on standard lines for heart failure. Major therapeutics used were intravenous frusimide 61(100%), frusimide/ spirolactone combination 61(100%), metolazone 16(26.22%), angiotensin converting enzyme inhibitors (ACEI) 39(63.9%), angiotensin receptor blockers (ARBs)

Table 2. summarizing clinical presentation, mode of delivery and baby condition in patients with peripartum cardiomyopathies.

Characteristics	NO (%)	Mean±SD
NYHA Functional class		
II	8(13.1)	
III	18(29.5)	
IV	35(57.5)	
Chest pain	36(59)	
palpitation	27(44.3)	
Cough	27(44.3)	
Fatigue	30(49.2)	
Ante partum Presentation	18(29.5)	
Postpartum Presentation	43(70.5)	
Delay in diagnosis(days)		6.5±3.8
Normal Vaginal Delivery	36(59)	
Assisted Vaginal Delivery	12(19.7)	
Caesarian Section	13(21.3)	
Baby Alive	50(82)	
Baby Dead	11(18)	

Table 3. summarizing investigation findings in patients with peripartum cardiomyopathies.

Investigation Findings	**NO (%)**	**Mean**±SD
Presenting ECG Findings		
Sinus Tachycardia	39(63.9)	
Left ventricular hypertrophy	42(68.9)	
T wave inversion	28(45.9)	
Poor R wave progression in precordial leads	40(65.6)	
Left Bundle Branch Block	9(14.8)	
Frequent PVCs	13(21.3)	
Echocardiograpic Findings		
Ejection fraction (EF %)		29.29±10.06
Chamber dilation	48(78.7)	
Moderate to Severe mitral regurgitation(MR)	15(24.6)	
Left ventricular thrombus	12(19.7)	
Pulmonary artery hypertension	15(24.6)	

5(8.2), hydralazine/nitrates combination 16(26.2), beta blockers 43(70.5%), bromocriptine 23(37.7%), digoxin 26(42.6%) and warfarin 12(19.7%). Some patients needed specialized therapies for heart failure including implantable cardiac defibrillator (ICD) 5(8.2%), cardiac resynchronization therapy (CRT) 3(4.9%) and cardiac transplantation or left ventricular assist device 8(13.1%). These are summarized in table 6.

Follow up at 3rd month, six more 6(9.8%) patients were dead while 33 (54.1%) r ecovered and 13 (21.3%) had heart failure. At 6th month follow up death rate was 3(4.9%), recovery 32(52.5%) and heart failure 11(18.03%). At 12th month follow up two more 2(3.3%) patients had died. Thirty-two 32(52.5%) patients had full recovery while 9(14.75%) were still suffering from heart failure. At the last follow up, total of 20(32.8%) were dead while 32(52.5%) had recovered fully and 9(14.75%) were still suffering from heart failure. These are summarized in table 6.

Particular attention was focused on subsequent

Table 4. summarizing complications during hospitalization in patients with peripartum cardiomyopathies.

Complication	Frequency (percentage %)
Ventricular tachycardia (VT)	8(13.1)
Atrial Fibrillation (AF)	8(13.1)
Cardiopulmonary Arrest	5(8.2)
Pulmonary edema	7(11.5)
Cardiogenic Shock	8(13.1)
Pericardial effusion	5(8.2)
Thromboembolism	13(21.3)
Need for intensive care (ICU)	23(37.7)

Table 5. Summarizing outcomes at hospital discharge, at 3 months, 6months and 12 months in patients with peripartum cardiomyopathies

Outcomes at Hospital	**NO (%)**	**Mean**±SD
Hospital death at first admission	9(14.8)	
Discharge with stable heart failure	52(85.2)	
Hospital stay(days)		6.62±2.31
At 3 Months		
Ejection Fraction (EF %) at 3 months		48.04±13.84
Deaths at 3 months	6(9.8)	
Recovery at 3 months	33(54.1)	
Heart failure at 3 months	13(21.3)	
At 6 Months		
Ejection Fraction (EF %) at 6 months		50.34±14.44
Deaths at 6 months	3(4.9)	
Recovery at 6 months	32(52.5)	
Heart failure at 6 months	11(18.03)	
At 12 Months		
Ejection Fraction (EF %) at 12months		53.37±11.56
Deaths at 12 months	2(3.3)	
Recovery at 12 months	32(52.5)	
Heart failure at 12 months	9(14.75)	
Total		
Recurrent Hospitalization		2.88±2.09
Total recovery	32(52.5)	
Patients left with disabling heart failure	9(14.75)	
Total death since diagnosis	20(32.8)	

Table 6. Showing frequency of therapeutics used in patients with peripartum cardiomyopathies

Therapeutics	Frequency (%)
Drugs	
Inotropic support	20(32.8)
Intravenous frusimide	61(100)
Frusimide/Spironolactone combination	61(100)
Metolazone	16(26.22)
Angiotensin converting enzyme inhibitors(ACEI)	39(63.9)
Angiotensin receptor blockers(ARBs)	5(8.2)
Hydralazine and nitrates	16(26.2)
Beta blockers	43(70.5)
Bromocriptine	23(37.7)
Digoxin	26(42.6)
Warfarin	12(19.7)
Need for Specialized Therapies	
Candidate for ICD	5(8.2)
Candidate for CRT	3(4.9)
Candidate for cardiac Transplant/LV Assist Device	8(13.1)

Table 7. Showing outcome of subsequent pregnancies during follow up in patients with peripartum cardiomyopathies

Variables	Frequency (percentage %)
Total patients followed	41
Abstinence from pregnancy	33(80.48)
Pregnancy occurred	8(19.5)
Asymptomatic during pregnancy	5(62.5)
Heart failure reoccur during pregnancy	3(37.5)
Death	0

pregnancies. We followed forty one patients. Due to effective counseling we were able to detect only 8 (19.5%) pregnancies. These were patients who had recovered fully from their initial illness. Among these patients five 5(62.5%) had uneventful course while two 3(37.5%) developed heart failure again. No death occurred in these patients. These are summarized in table 7.

DISCUSSION

Peripartum cardiomyopathy is an uncommon form of congestive heart failure affecting women in the last months of pregnancy or early puerperium with potentially devastating consequences.[5] Very little is known about the incidence of PPCM. From the available literature, the incidence of PPCM appears to be around 1 in 2500–4000

in the USA, 1 in 1000 in South Africa, and 1 in 300 in Haiti (Fett et al., 2005; Sliwa et al., 2006; Witlin et al., 1997). Our institution is tertiary care referral centre receiving cases from local population as well as from Afghanistan so the exact incidence cannot be predicted due to unknown number of deliveries for these cases. We got only 30 cases from our hospital where averagely 7200 deliveries occurred annually. Using this number the estimated incidence is 1 per 960 deliveries.

Common reported risk factors for PPCM are advanced maternal age, multiparity, multiple gestations, black race, obesity, malnutrition, gestational hypertension, pre-eclampsia, poor antenatal care, alcohol and tobacco abuse, low socioeconomic conditions and long term tocolysis as found in various studies (Ahmed et al., 2003; Memon et al., 2005; Mohd et al., 2006; Avila et al., 2002; Sharieff and Zaman, 2003). In our study the most significant risk factors found were advancing maternal age, multiparity, obesity, chronic hypertension and pre-eclampsia and long term tocolysis. PPCM has been reported mostly in women older than 30 years (Ahmed et al., 2003; Memon et al., 2005; Mohd et al., 2006; Avila et al., 2002; Sharieff and Zaman, 2003). In our study also the mean age noted was 30.94 ± 6.63 years. Thirty-three 33(54.1%) patients were above thirty years of age. More than half of our patients (54.1%) were obese with a mean body weight of 73.5±6.91 Kg indicating obesity as a risk factor (Sliwa et al., 2006; Bhakta et al.,2007) This condition has been described in multiparous women (Memon et al., 2005; Avila et al., 2002; Sharieff and Zaman, 2003; Bhakta et al., 2007). In our study most of patients (80.3%) were multiparous. This condition is also more frequent in women with multiple gestations Memon et al., 2005; Avila et al., 2002; Sharieff and Zaman, 2003; Bhakta et al., 2007). However, in our study multiple gestations were only 8.2%. In the USA majority of such patients are of African-American origin though Asians, Hispanic and Caucasian mothers are also affected (Avila et al., 2002; Sharieff and Zaman; Nazir et al., 2005). In our study majority of the patients (70.5%) were of Pathan, s ethnic origin which is white race. Pre-eclampsia and chronic hypertension have been associated with a significant number of PPCM cases in various studies (Ansari et al., 2002; WHO expert consultation, 2004; Elkayam et al., 2005). Our study showed an association of 50 %. Similarly, long term tocolysis with oral salbutamol and terbutaline in women with preterm labour especially if combined with antenatal steroid administration for foetal lung maturation is a risk factor Memon et al., 2005; Avila et al., 2002; Sharieff and Zaman, 2003; Bhakta et al., 2007). Twenty-one (21.3%) patients in our study received tocolysis and later developed cardiomyopathy. The reason for the association of PPCM with the above risk factors is not fully understood.

All patients presented with dyspnea and were in NYHA class III (29.5%) and IV (57.5%) in our study as is seen in other studies (Memon et al., 2005; Sharieff and Zaman, 2003). Some patients presented with chest pain (59%), cough (44.3%), palpitation (44.3%) and fatigue (49.2%) which is in accordance with published literature (Pearson et al., 2000; Ro and Frishman, 2006; Ramaraj and Sorrell, 2009). Majority of women presented in postpartum period. It is evidendent from other studies in which postpartum presentation was 78% (Lampert and Lang, 1995). The diagnosis of PPCM is often made late. The delay in reaching a correct diagnosis ranged from weeks to months in around 30% of cases (Hilfiker-Kleiner et al., 2007; Mielniczuk et al., 2006; Stepan et al., 2003). In our study it is 6.5±3.86 days. This clinical picture can be mistaken for another disorder, such as pneumonia or depression. Therefore, when a woman presents in the puerperium with these findings, an echocardiogram should be considered. Misinterpretation of the clinical picture and delayed diagnosis and treatment of heart failure can have detrimental consequences, and observational data suggest that potential specific treatments are only effective if started early (Hilfiker-Kleiner et al., 2007; Mielniczuk et al., 2006; Stepan et al., 2003).

Various studies had described ECG findings in peripartum cardiomyopathies. According to those studies sinus tachycardia (68.4%), cavity hypertrophy (78.8%) and T wave inversion (47.3%) were more frequent findings (Fett et al., 2005; Tibazarwa et al., 2012; Diao et al., 2004; Lata et al., 2009) In our study sinus tachycardia was 63.9% while LV hypertrophy and T wave inversion were 68.9% and 45.9% respectively. Similarly various studies have reported echocardiograpic features of peripartum cardiomyopathies. According to those reduced ejection fraction, chamber dilation, moderate to severe mitral regurgitation, left ventricular thrombus and raised pulmonary artery pressure were the frequent findings. The findings in our study are consistent with those studies (Elkayam et al., 2005; Chapa et al., 2005; Sliwa et al., 2000; Duran et al., 2008).

Various complications have been described in patients with peripartum cardiomyopathy. These include pulmonary edema, cardiogenic shock; thromboembolic events, ventricular tachycardia, cardiopulmonary arrest and atrial fibrillation (Sakakibara et al., 1970; Avila et al., 2002; Sharieff and Zaman, 2003). In our study these were also the major complications emerged.

Various studies have described mode of delivery and neonatal outcome in such patients. In study by Jahan Ara Hasan et al. 68.75% of patients had normal vaginal delivery, 6.2 % assisted vaginal delivery and 31.6% caesarean section (Sakakibara et al., 1970). In our study 59% of patients had normal vaginal delivery, 19.7% assisted vaginal delivery and 21.3% required caesarean section mainly due to obstetric reasons. A multidisciplinary team including obstetrician, cardiologist, anesthesiologist and perinatologist took care of patients. Regarding neonatal outcome 82% babies were live born,

and 18% perinatal deaths occurred which is also in accordance with published literature (Sakakibara et al., 1970). Main cause of perinatal deaths were prematurity, IUGR and associated congestive cardiac failure in mothers.

The principles of managing acute HF due to PPCM are no different than those applying to acute HF arising from any other cause and are summarized in the recent ESC/ESICM guidelines (Dickstein et al., 2008). Briefly, rapid treatment is essential, especially when the patient has pulmonary edema and/or hypoxemia. Oxygen should be administered in order to achieve an arterial oxygen saturation of ≥95%, using, where necessary, non-invasive ventilation with a positive end-expiratory pressure of 5–7.5 cm H2O. Intravenous (i.v.) diuretics should be given when there is congestion and volume overload, with an initial bolus of frusimide 20–40 mg i.v. recommended. Intravenous nitrate is recommended (e.g. nitroglycerine starting at 10–20 up to 200 µg/min) in patients with a systolic blood pressure (SBP) >110 mmHg and may be used with caution in patients with SBP between 90 and 110 mmHg (Hasan et al., 2010).

Inotropic agents should be considered in patients with a low output state, indicated by signs of hypoperfusion (cold, clammy skin, vasoconstriction, acidosis, renal impairment, liver dysfunction, and impaired mentation) and those with congestion which persists despite administration of vasodilators and/or diuretics. When needed, inotropic agents (dobutamine and levosimendan) should be administered without unnecessary delay and withdrawn as soon as adequate organ perfusion is restored and/or congestion reduced (Hasan et al., 2010).

If a patient is dependent on inotropes or intra-aortic balloon pump counter pulsation, despite optimal medical therapy, implantation of a mechanical assist device or cardiac transplantation should be considered. Since the prognosis in PPCM is different from DCM with a significant proportion of patients normalizing their LV function within the first 6 months post-partum, an LV-assisted device (LVAD) may be considered before listing the patient for cardiac transplantation.[4,44] In our study 37.7%of patients needed intensive care treatment due to pulmonary edema and cardiogenic shock. Some patients needed specialized therapies for heart failure. Five patients needed ICD therapy, 3 patients CRT and 8 needed LV assist device or cardiac transplantation.

Once a patient is stabilized, it should be treated in accordance with the current ESC guidelines for HF (Hasan et al., 2010). It includes use of frusimide, ACE inhibitors, ARBs, spirolactone and beta blockers. Breastfeeding should be discontinued. During pregnancy; the following restrictions to these guidelines apply. Angiotensin-converting enzyme (ACE)-inhibitors and angiotensin-II receptor blocker (ARB) are contraindicated because of serious renal and other foetal toxicity (I-C) (Schaefer, 2003; Cooper et al., 2006). Hydralazine and long-acting nitrates are considered safe in pregnancy, instead of ACE-inhibitors/ARBs, in patients with PPCM (Moioli et al., 2009). β-blockers have not been shown to have teratogenic effects (Ghuman et al., 2009). β-1-selective drugs are preferred because β-2 receptor blockade can, theoretically, have an anti-tocolytic action. Diuretics should be used sparingly as they can cause decreased placental blood flow.[3, 49] Frusimide and hydrochlorothiazide are most frequently used. Spironolactone is thought to have anti-androgenic effects in the first trimester. Because the effects of eplerenone on the human fetus are uncertain, it should also be avoided during pregnancy (Hasan et al., 2010; Muldowney et al., 2009). Fetotoxicity of warfarin needs to be considered in all patients with PPCM and LVEF <35%. Unfractionated or low-molecular-weight heparin can be used. Fetotoxicity of warfarin needs to be considered ((Hasan et al., 2010). Bromocriptine may be a novel disease-specific treatment for PPCM. Several case reports have suggested that the addition of bromocriptine to standard therapy for HF may be beneficial in patients with acute onset of PPCM (Gouley et al., 1937; Habedank et al., 2008; Meyer et al., 2010; Jahns et al., 2008). In our study patients were frequently treated with the above drugs.

The prognosis for women with PPCM appears to depend on the normalization of left ventricular size and function within 6 months after delivery. In one study, approximately half of 27 women studied had persistent left ventricular dysfunction. In this group, the cardiac mortality rate was 85% over 5 years, compared with the group in whom cardiac size returned to normal, who experienced no reported cardiac mortality in the same time interval (Demakis et al., 1971). A more recent study corroborates these results: 50% (7/14) of patients had dramatic improvement soon after delivery, but 6 of the 7 remaining patients died. Survivors were found to have a higher mean ejection fraction (23% vs. 11%) and smaller mean left ventricular cavity size (5.8 vs. 6.9 cm) at diagnosis (Sutton et al., 1991). In our study recovery as evidenced by improvement in clinical features and normalization of echocardiograpic findings at 12 months was observed in 52.5% of patients. Mean hospital stay was 6.62±2.31 days. Prognosis is related to left ventricular dysfunction at presentation and recovery as shown in various studies. Recovery mostly occurs in first 2 months but it can take 6-12 months as is evident from our study also (Bhakta et al., 2007).

Family-planning counseling is very important as women with PPCM are usually in the middle of family building. Only a few studies have reported on subsequent pregnancies of women with a history of PPCM. In a retrospective investigation, Elkayam et al. studied 44 women with PPCM and a subsequent pregnancy and found that LVEF increased after the index pregnancy but decreased again during the subsequent pregnancy,

irrespective of earlier values. Development of HF symptoms were more frequent in the group where LEVF had not normalized before the subsequent pregnancy (44 vs. 21%). In addition, three of the women with a persistently low LVEF entering the subsequent pregnancy died, whereas none with normalized LVEF died. There was no perinatal mortality. In a retrospective study, Habli et al. compared 70 patients with PPCM, where 21 had a successful subsequent pregnancy, 16 terminated the pregnancy, and the remaining 33 had no subsequent pregnancy. Ejection fraction at diagnosis was higher in those who had a successful subsequent pregnancy, but had no relation to worsening clinical symptoms, which developed in nearly one-third of those patients (Habli et al., 2008). In our study we detected only eight pregnancies in which five were asymptomatic and three developed heart failure. These were those patients who had recovered completely from their initial heart failure.

CONCLUSION

Peripartum cardiomyopathy (PPCM) is a rare but potentially life-threatening illness. All women having clinical features suggestive of PPCM should be evaluated using echocardiography and modern diagnostic criteria. Standard management of cardiac failure using a multidisciplinary approach should be started. Patients should be followed up for recovery and those with persistent ventricular dysfunction should be properly counseled for contraception and avoidance of pregnancy. Subsequent future pregnancies if occur, should be managed in multidisciplinary units.

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