Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

A Novel Approach for Screening and Incidence of PeriPartum Cardiomyopathy (PPCM) in a year at atertiary Centre : A Retrospective Study

Dr Anshul Goel[1] Dr Anam Sarwar[2] Dr Deeksha[3] Dr Anumeha Jain[4] Dr C.K Vyas[5]

1. PG Resident 3rd year, Department Of Anaesthesiology, National Institute of Medical Sciences, Jaipur, India
2. PG Resident 3rd year, Department Of Obstetrics and Gynaecology, National Institute of Medical Sciences, Jaipur,India
3. Assistant Professor, Department Of Anaesthesiology, National Institute of Medical Sciences, Jaipur, India
4. Professor and Head, Department Of Anaesthesiology, National Institute of Medical Sciences, Jaipur, India
5. Professor, Department Of Anaesthesiology, National Institute of Medical Sciences, Jaipur, Indi

*** Correspondence: Dr Ashwani Verma**

Assistant Professor, Department Of Obstetrics and Gynaecology, National Institute of Medical Sciences, Jaipur, IndiaEmail: ashwaniverma270891@gmail.com

ABSTRACT

Background: Peripartum cardiomyopathy (PPCM) is an idiopathic, potentially life- threatening condition that affects women in the peripartum period. Prior definitions, Echocardiography cut-offs and being a diagnosis of exclusion have lead to women with this condition being overlooked or mis-diagnosed leading to higher mortality.

Aim and Objective: To develop a novel approach for Screening and finding Incidence of PeriPartum Cardiomyopathy (PPCM) in a year at a tertiary Centre.

Result: Among the 981 deliveries, 4 cases were diagnosed with PPCM during one year of study making incidence as 4.07 cases/ 1000 people-year i.e approximately 4 case per 1000 in a year. As the study was conducted at a tertiary referral centre in a rural setting, the incidence of PPCM came out to be significantly higher than the national average.

Conclusion: Diagnosing PPCM requires a high index of suspicion and awareness among the primary caregivers. PPCM were noted in cases, which were unbooked without ANC follow-up indicating need importance of regular antenatal checkups. Early diagnosis and systematic approach is determining factor of maternal and fetal outcome.

Keywords: Peripartum cardiomyopathy, screening, incidence, pregnancy, heart failure, early detection, maternal outcomes

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

Introduction:

Peripartum cardiomyopathy (PPCM) is an idiopathic, potentially life-threatening condition that affects women in the peripartum period. Early detection and intervention plays a crucial role in improving outcomes in PPCM patients.

In this paper, we propose a novel approach for screening PPCM and investigate its incidence in a cohort of peripartum women admitted in Obstetrics and Gynaecology department at NIMS University and Hospital, Jaipur over a period of 1 year i.,e from July 2023 to June 2024. Our findings suggest that this new screening method holds promise for early detection and management of PPCM, thereby potentially reducing morbidity and mortality associated with this condition. Despite advances in medical care, PPCM remains a significant cause of maternal morbidity and mortality worldwide.

However, existing screening methods may lack sensitivity or specificity, leading to delayed diagnosis and treatment initiation. Screening methods are continually evolving, driven by technological advancements and the need for higher diagnostic accuracy. Our novel approach to screening can significantly impact patient outcomes by enabling earlier detection of conditions that might otherwise be overlooked or diagnosed at more advanced stages. This retrospective study aims to evaluate the incidence and effectiveness of a newly implemented screening method at a tertiary care centre over the course of a year. By analysing the outcomes of this approach, the study seeks to provide insights into its potential benefits, limitations, and overall impact on clinical practice. The findings from this research could inform future screening protocols and contribute to the broader adoption of more effective diagnostic tools in tertiary healthcare settings.

DEFINITIONS OF PPCM

American Heart Association (AHA)[1]	PPCM is defined as an idiopathic cardiomyopathy presenting with heart failure secondary to left ventricular (LV) systolic dysfunction toward the end of pregnancy or in the months following delivery, without any other identifiable cause of heart failure. The LV may not be dilated but the ejection fraction (EF) is typically less than 45%.
European Society of Cardiology (ESC)[2]	PPCM is described as heart failure that occurs towards the end of pregnancy or in the months following delivery, where no other cause of heart failure is found. It involves a reduced EF of less than 45%, and the condition is distinct from other types of cardiomyopathy that can occur during pregnancy.
Heart Failure Associationof the ESC (HFA-ESC)[3]	Peripartum cardiomyopathy (PPCM) is a potentially life-threatening condition typically presenting as heart failure with reduced ejection fraction (HFrEF) in the last month of pregnancy or in the months following delivery in women without another known cause of heart failure.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

World Health Organisation (WHO)[4]	PPCM is described as a form of dilated cardiomyopathy with onset in the last trimester of pregnancy or within five months after delivery, featuring reduced EF and an absence of any other identifiable cause ofheart failure.

Methodology:

Retrospective Study type

Study Population :

All pregnant women visiting Obstetric and Gynaecology OPD in NIMS fulfilling inclusion and exclusion criteria.

Inclusion criteria:

1. All women in last month of pregnancy and within five months of postpartum period.
2. Consenting to participate in the study.

Exclusion criteria:

All patients with pre-existing heart disease.

Ethics and dissemination:

As this research is a systematic review of published literature, ethical approval is not required. The results will be reported according to the latest guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement, and will be submitted to a peer-reviewed journal.

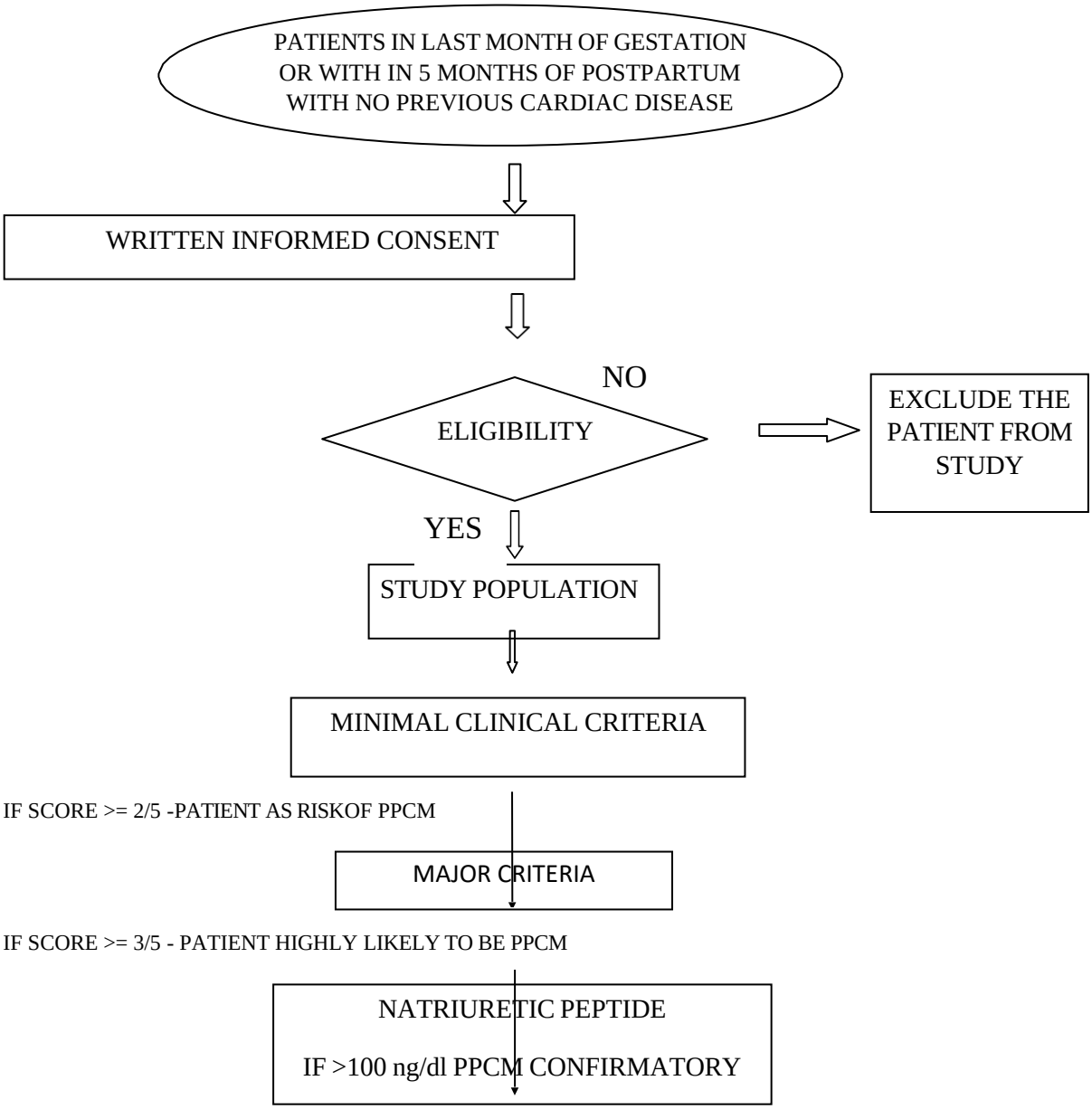
Materials and methods:

This retrospective, observational study was conducted among women in last month of pregnancy or within five months of postpartum who presented at NIMS obstetric and Gynaecology OPD from 1 July 2023 to 30 July 2024. In total, 1111 patients were taken,

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

out of which 1030 patient met our inclusion and exclusion criteria. And using ourscreening criteria, we were able to early detect and diagnose PPCM.

FLOW CHART :



ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

TABLE 1: MINIMAL CLINICAL CRITERIA

CLINICAL SIGN OR SYMPTOM	PRESENT	ABSENT
DYSPNEA	1	0
PEDAL EDEMA	1	0
PALPITATION	1	0
INCREASED NOCTUREA	1	0
FATIQUE	1	0

TABLE 2: MAJOR RADIOLOGICAL CRITERIA

INVESTIGATION	PRESENT	ABSENT
CXRAY (WITH CARDIOMEGALY OR/AND SIGNS OF PULMONARY EDEMA	1	0
LVEF (<45%) IN 2D ECHO	2	0
LV FRACTIONAL SHORTENING <30% IN2D ECHO	1	0
LV END DIASTOLIC DIAMETER >2.7 cm/m^2	1	0

DISCUSSION:

Demakis ans Rahimtoola[5] described PPCM as severe form of heart failure comprising of 3criteria; namely

1. Development of heart failure in the last month of pregnancy or within first 5 month postpartum,
2. Absence of any determinable cause of cardiac failure and/or any prior demonstrable heart disease.
3. Later, Echocardiography evidence was added by National institute of Health which included LVEF < 45% LV. With Fractional Shortening < 30% and LV End diastolic diameter more than 2.7 cm/m2.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

The development of peripartum cardiomyopathy (PPCM) is complex, influenced by a combination of genetic and environmental factors, along with significant hormonal changes during the peripartum period. Research indicates that disruptions in vascular and metabolic functions are key to the onset of PPCM, with oxidative stress and the cleavage of prolactin into angiostatic fragments playing crucial roles in the pathogenesis of heart failure. Risk factors include advanced maternal age, multiple pregnancies, preeclampsia, gestational hypertension, and the use of tocolytic drugs. These elements can compromise cardiovascular stability, leading to symptoms of heart failure. Effective management requires vigilant monitoring of patients at risk and prompt intervention to enhance outcomes and mitigate serious complications.

Preeclampsia contributes to the development of PPCM through mechanisms involving increased blood pressure and endothelial dysfunction, which can lead to cardiac strain and compromised heart function. The condition is characterised by high blood pressure and proteinuria, which can exacerbate cardiovascular stress during and after pregnancy, potentially triggering PPCM in susceptible women.

It is an uncommon but significant condition affecting pregnant women in India, with varying incidence rates across different regions. In a rural public hospital in South India, the incidence was found to be 1 in 453 live births over a four-year period, with significant maternal recovery observed within a year [Pandit et al., 2009][6]. A study from a rural tertiary care centre in Gujarat reported a lower incidence of 0.3% and highlighted the critical need for early diagnosis and prompt multidisciplinary management to improve maternal and fetal outcomes [Bhattacharjee et al., 2017][7]. In another study conducted in South India, the incidence of PPCM was reported to be 1 in 1374 live births, with significant risk factors including multiparity and advanced maternal age [Pandit et al., 2009][6]. These regional studies underline the need for heightened awareness and better diagnostic measures to address PPCM effectively across the country.

In our study, the criteria and process for diagnosis of PPCM are as follows:-

1. Target patient population- The study includes patient who are either in the last month of gestation or within five months postpartum with no history of previous cardiac diseases.
2. Written informed consent is mandatory for all participants.
3. Minimal clinical criteria evaluation

The most common reported symptom was shortness of breath at rest followed by palpitations.

However, the actual categorisation used by NYHA in advanced pregnancy can be confounded by the physiological changes of pregnancy.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

Early diagnosis of PPCM is challenging because of physiological changes of late stage of pregnancy. However, PPCM typically manifests in postpartum period, when physiological changes of pregnancy are expected to normalise, thus, if a patient presents with persistent or worsening of signs and symptoms of cardiac heart failure, especially in puerperium, the possibility of PPCM should always be considered.

The minimal criteria such as:Dyspnoea

Pedal oedema Palpitations Increased NocturiaFatigue

Each clinical signs and symptoms is evaluated for its presence and a score of one or zero is assigned based on its presence or absence.

A score of 2 out of 5 or higher indicates that the patient is at risk for PPCM.

The patients who satisfy the minimal clinical criteria are assisted using a scoring system based on major criteria which include radiological investigations, such as chest, x-ray, and 2D Echo. A score of 3 out of 5 or higher suggest that the patient is highly likely to have PPCM, each investigation parameters is assessed for its presence or absence.

1. Chest X-ray (Lead Shielded), cardiomegaly and/or signs of pulmonary oedema assigned score of one. A recent study conducted in 2023 by Nihal AL Riyami[8] on 116 cases of PPCM suggested Chest X-ray showed cardiomegaly in 16 (17.2%), pulmonary congestion in 10 (11.0%), plural effusion in six (6.7%) andobliterated costo-phrenic angle in three (3.2%) patients.
2. Echocardiography is the most valuable and confirmatory diagnostic tool. Patient may present features of severe ventricular dysfunction such as decreased left ventricular ejection fraction (<45%) which is assigned two points. Decreased left ventricular fractional shortening less than 30% and increased left ventriculardiastolic diameter more than 2.7 cm/m2 in 2D Echo.

Biomarkers :- Patients with acute PPCM have consistently elevated plasma concentration of natriuretic peptides. The most important role of natriuretic peptides is to rule out heart failure (with a threshold < 100 pg/ml for BNP can be ruled out with high probability) , raised levels of BNP with presence of above mentioned criteria’s should be used solely to

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

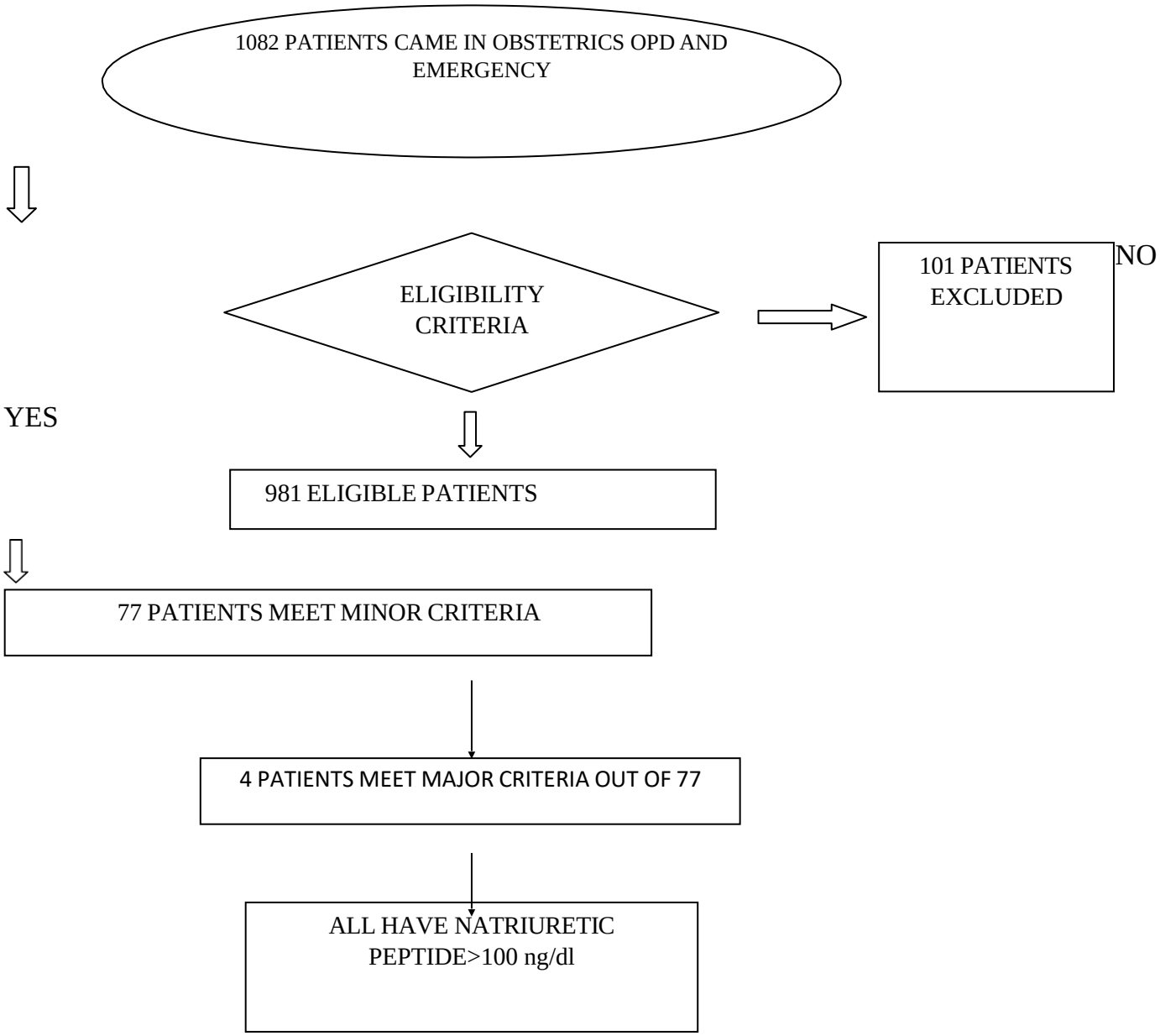
establish the diagnosis of PPCM . Although one study demonstrated plasma BNP levels >1860 pg/ml as an independent factor for persistent LV dysfunction.[10]

TABLE 3: TOTAL AND ELIGIBLE PATIENTS

MONTH	ELIGIBLE PATIENTSFOR STUDY	PATIENTS MEETING MINOR CRITERIA	PATIENTS MEETING MINOR CRITERIA
JULY 2023	96	9	1
AUGUST 2023	99	5	0
SEPTEMBER 2023	104	6	1
OCTOBER 2023	103	9	0
NOVEMBER 2023	72	2	0
DECEMBER 2023	62	8	0
JANUARY 2024	87	10	0
FEBRUARY 2024	73	5	0
MARCH 2024	82	6	0
APRIL 2024	60	9	0
MAY 2024	75	3	0
JUNE 2024	68	5	1
TOTAL	**981**	**77**	**3**

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

ELIGIBLE PATIENTS - Patients meeting inclusion and exclusion criteria.



ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

TABLE 4: PATIENT DATA

	PATIENT 1	PATIENT 2	PATIENT 3	PATIENT 4
DYSPNOEA	PRESENT (1)	PRESENT (1)	PRESENT (1)	PRESENT (1)
PEDAL EDEMA	PRESENT (1)	ABSENT (1)	PRESENT (1)	ABSENT (0)
PALPITATION	PRESENT (1)	PRESENT (1)	PRESENT (1)	PRESENT (1)
INCREASED NOCTURIA	PRESENT (1)	ABSENT (0)	PRESENT (1)	ABSENT (0)
FATIGUE	PRESENT (1)	PRESENT (1)	PRESENT (1)	PRESENT (1)
CLINICAL CRITERIA SCORE	**5/5**	**3/5**	**5/5**	**3/5**
CXRAY (WITH CARDIOMEGALY OR/ AND SIGNS OF PULMONARY EDEMA	PRESENT (1)	PRESENT (1)	PRESENT (1)	PRESENT (1)
LVEF (<45%) IN 2D ECHO	30% (2)	30-35% (2)	30% (2)	30-35% (2)
LV FRACTIONAL SHORTENING <30% IN2D ECHO	25% (1)	25% (1)	20% (1)	25% (1)
LV END DIASTOLIC DIAMETER >2.7 cm/m^2	2 cm/m^2 (1)	2.5 cm/m^2 (1)	2 cm/m^2 (1)	2.2 cm/m^2 (1)
RADIOLOGICAL CRITERIA SCORE	**5/5**	**5/5**	**5/5**	**5/5**
PRO-BNP VALUES	**37392**	**22758**	**35389**	**26788**

TABLE 5: RELATION WITH OTHER FACTORS

	PATIENT 1	PATIENT 2	PATIENT 3	PATIENT 4
AGE	24 YEARS	29 YEARS	29 YEARS	25 YEARS
PARITY AT PRESENTATION	PRIMI	G2P1L1	P5L5A4	G2P1L1
TIME OF PRESENTATION	37 WEEKS+2 DAYS	39 WEEKS + 6 DAYS	25 DAYS POST DELIVERY	35 WEEKS+1DAY
PREVIOUS PPCM	NO	NO	YES	NO
H/O HDP	PRE ECLAMPSIA WITH HELPP	NO	NO	ECLAMPSIA
MODE OF DELIVERY	EMERGENCY LSCS	EMERGENCYLSCS	EMERGENCY LSCS	EMERGENCY LSCS
FETAL OUTCOME	MALE CHILD (2.66 kg)	FEMALE CHILD(2.90 kg)	FEMALE CHILD (2.99 kg)	MALE CHILD (2.34 kg)
HOSPITAL STAY	11 DAYS (09/07/23 TO 19/07/23)	04 DAYS (27/09/23TO 30/09/23)	8 DAYS (02/03/24 TO10/03/24)	04 DAYS (28/06/24 TO 01/07/24)

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

CONCLUSION:

Even after recent advancement in healthcare services, PPCM still remains difficult to diagnose. Prior definitions, Echocardiography cut-offs and being a diagnosis of exclusion have lead to women with this condition being overlooked or mis-diagnosed. Following the methodology as provided in our study can help in early diagnosis and management. Women considering subsequent pregnancies should be counselled and monitored systematically. Among the 981 deliveries, 4 cases were diagnosed with PPCM during one year of study making incidence as 4.07 cases/ 1000 people-year i.e approximately 4 case per 1000 in a year. As the study was conducted at a tertiary referral centre in a rural setting, the incidence of PPCM came out to be significantly higher than the national average of 0.75 per 1000 live births (1 in 1340 live births)[11]. The time constraints made this study to be concluded in a year, this warrants a further longer duration study to be conducted on a large scale.

All of them were referred cases from regional hospitals with symptoms, such as difficulty in breathing and palpitations. Further study is required in order to better diagnose and manage PPCM but using the scoring system as described in the study, patients were diagnosed to be cases of PPCM at the earliest. Out of four cases, three were diagnosed during antenatal period and one during postpartum period. All the patients under emergency Caesarean section. There were no maternal and fetal mortality. All patient had complete event free recovery and left ventricular functions improved at the time of discharge. Diagnosing PPCM requires a high index of suspicion and awareness among the primary caregivers. PPCM were noted in cases, which were unbooked without ANC follow-up indicating need importance of regular antenatal checkups. Early diagnosis and systematic approach is determining factor of maternal and fetal outcome.

REFERENCES:

1. Rodriguez Ziccardi M, Siddique MS. Peripartum Cardiomyopathy. [Updated 2023 Jul 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482185/

2. Zolt Arany, Uri Elkayam. Peripartum Cardiomyopathy. Circulation. 2016;133:1397-1409. DOI: 10.1161/CIRCULATIONAHA.115.020491. PMID**: 27045128**

3. Bauersachs, J., König, T., van der Meer, P., Petrie, M.C., Hilfiker-Kleiner, D., Mbakwem, A., Hamdan, R., Jackson, A.M., Forsyth, P., de Boer, R.A., Mueller, C., Lyon, A.R., Lund, L.H., Piepoli, M.F., Heymans, S., Chioncel, O., Anker, S.D.,

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 11, 2024

Ponikowski, P., Seferovic, P.M., Johnson, M.R., Mebazaa, A. and Sliwa, K. (2019), Pathophysiology, diagnosis and management of peripartum cardiomyopathy: a position statement from the Heart Failure Association of the European Society of Cardiology Study Group on peripartum cardiomyopathy. Eur J Heart Fail, 21: 827-843. https:// doi.org/10.1002/ejhf.1493

4. Mandal D, Dattaray C, Dutta M, Sarkar G, Sinha P. Peripartum cardiomyopathy coexistent with human immunodeficiency virus: A substantial obstetric jeopardy. Heart Views 2013;14:26-8. © Gulf Heart Association 2013.

5. Demakis JG, Rahimtoola SH. Peripartum cardiomyopathy. Circulation. 1971 Nov;44(5):964-8. doi: 10.1161/01.cir.44.5.964. PMID: 4255967.

6. Pandit V, Shetty S, Kumar A, Sagir A. Incidence and outcome of peripartum cardiomyopathy from a tertiary hospital in South India. Trop Doct. 2009 Jul;39(3):168-9. doi: 10.1258/td.2008.080353. PMID: 19535757.

7. Bhattacharyya A, Basra SS, Sen P, Kar B. Peripartum cardiomyopathy: a review. Tex Heart Inst J. 2012;39(1):8-16. PMID: 22412221; PMCID: PMC3298938.

8. Al Riyami N, Al Khayari S, Al Zadjali R, Machado L, Al Madhani A, Al Lawati H. Incidence, Risk Factors, Maternal and Neonatal Outcomes of Peripartum Cardiomyopathy (PPCM) in Oman. Glob Heart. 2023 May 2;18(1):23. doi: 10.5334/ gh.1198. PMID: 37153846; PMCID: PMC10162354.

9. Ker JA, Soma-Pillay P. NT-proBNP: When is it useful in Obstetric Medicine? Obstet Med. 2018 Mar;11(1):3-5. doi: 10.1177/1753495X17736717. Epub 2017 Nov 22. PMID: 29636806; PMCID: PMC5888844.

10. Biteker M, Ozlek B, Ozlek E, Cil C, Celik O, Dogan V, Basaran O. Predictors of early and delayed recovery in peripartum cardiomyopathy: a prospective study of 52 patients. J Matern Fetal Neonatal Med 2018 Sep 27. https://doi.org/10.1080/14767058.2018.1494146.

11. Agarwal, Rakesh MBBS, MD, DM1,; Baid, Rashmi MBBS, MS, DNB, CCGDM2; Sinha, Dhurjati Prasad MBBS, MD, DM3. Peripartum Cardiomyopathy in Indian Population: A Pooled Analysis. Journal of Clinical and Preventive Cardiology 10(2):p 54-57, Apr–Jun 2021. | DOI: 10.4103/jcpc.jcpc_61_20