International Journal of Biomedical Research
ISSN: 0976-9633 (Online); 2455-0566 (Print)
Journal DOI: 10.7439/ijbr
CODEN: IJBRFA

Original Research Article

Perioperative management of obstetrical surgeries in women having coexisting cardiovascular disease: Our experience

Habib Md Reazaul Karim[*1], Sairem Mongolnganbi Chanu Devi[2], Md Yunus[3] and Samarjit Dey[4]

[1]*Assistant Professor, Department of Anaesthesiology, Andaman and Nicobar Islands Institute of Medical Sciences and GB Pant Hospital, Port Blair, Ex-Resident, NEIGRIHMS, Shillong, India.*
[2]*Senior Resident, Department of Obstetrics and Gynecology, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS). Shillong, India.*
[3]*Additional Professor, Department of Anaesthesiology, Critical Care and Pain Medicine, NEIGRIHMS, Shillong, India*
[4]*Assistant Professor, Department of Anaesthesiology, Critical Care and Pain Medicine, NEIGRIHMS, Shillong, India*

***Correspondence Info:**
Dr. Habib Md Reazaul Karim, MD, DNB, IDCCM
Department of Anaesthesiology
First floor, Main OT complex
Andaman and Nicobar Islands Institute of Medical Sciences and GB Pant Hospital,
Port Blair, India. PIN – 744104
E-mail: drhabibkarim@gmail.com

Abstract

Background and aim: Coexisting cardiovascular disease in pregnancy is associated with high maternal morbidity and mortality. These patients pose a great challenge to both anesthesiologist and obstetrician. Present study was aimed at reviewing the perioperative management and outcome of obstetrical surgeries in women who had coexisting cardiovascular disease in a tertiary care teaching institute.

Materials and Methods: Departmental database of all pregnant patients with coexisting cardiovascular diseases who underwent obstetrical surgeries during January 2011 to August 2016 were reviewed. Patients functional status, obstetrical history, stage of labor, type of anaesthesia, monitoring, hemodynamics, post operative care and baby outcome were noted. Data are expressed in absolute number and percentage scale and INSTAT software was used for measuring central tendencies and dispersion.

Results: A total of 22 women (mean ± Standard deviation: SD age 26.18 ± 4.78 years) were found eligible and included for analysis. 21(95.45%) patients underwent cesarean section and one medical termination of pregnancy. 68.18% cases were done under subarachnoid block. Most of the patient needed post operative high dependant unit care, one patient developed mild pulmonary edema and no maternal and fetal deaths were noted. All the babies were born with APGAR > 7 at 1 min. No patient was managed using pulmonary artery catheter or continuous cardiac output monitoring.

Conclusion: Pregnant patients with coexisting cardiovascular disease need multidisciplinary approach, timely delivery and intensive therapy in perioperative period. They can be safely delivered under subarachnoid blocks. Pulmonary artery catheterization is probably not an essential for hemodynamics management of such patients in perioperative management.

Keywords: Pregnancy, cardiovascular disease, anaesthesia, hemodynamic monitoring, cesarean section. .

1. Introduction

Cardiovascular disease is one of the leading and the most common indirect cause of pregnancy related maternal deaths in the developed countries. It contributes to 10 – 13% of the maternal deaths and the contribution as cause is in increasing trend.[1,2] A dynamic process like pregnancy leads to many significant physiological changes in cardiovascular system including notable changes in hemodynamics.[3] Co-existing cardiovascular diseases in pregnant women leads to worsening situation. Management of such expectant mothers in peripartum period is a great challenge for both obstetrician and anesthesiologists. Hemodynamic management remains one of the primary concerns along with safe delivery of baby and well being of mother. Large prospective studies comparing the outcome of baby and mother with different modalities of hemodynamic monitoring and anesthetic techniques are relatively missing. Therefore, gold standard or strong evidence based recommendations in this aspect is also lacking.

The current study was aimed at reviewing the perioperative management of pregnant women with cardiovascular coexisting diseases who underwent obstetrical surgery. This will help perioperative care givers to formulate a better management plan. It will also contribute to the data bank for making evidence based decisions in future.

2. Materials and Methods

After approval from the Institute authority, departmental database of all pregnant patients with coexisting cardiovascular diseases who underwent obstetrical surgeries during January 2011 to August 2016 were reviewed. Age, obstetrical history, functional status, urgency of cesarean delivery, [4] type of anaesthesia, monitoring, hemodynamics, post operative care and baby outcome in terms of APGAR below 7 at one minute and neonatal intensive care (NICU) treatment requirements were noted. Use of vasopressor and high dependant units (HDU) or intensive care units (ICU) for postoperative care were also noted. A master chart in Microsoft Excel 2007 (Microsoft Corporation, USA) was prepared for these data. Quantitative data are expressed in absolute number and percentage scale. Metric data were further analyzed for measuring central tendencies and dispersions using INSTAT software (GraphPad Prism Software, La Zolla, CA, USA). The cohort was further sub grouped based on anesthetic management and major events were compared using Fishers exact test and $p < 0.05$ was considered as significant.

3. Results

A total of 22 pregnant women underwent obstetrical surgeries during the study period and were included for analysis. The mean ± standard deviation: SD (95% confidence interval: CI) age 26.18 ± 4.78 (24.05 – 28.30) years. 21 (95.45%) of the obstetrical surgery was lower segment cesarean section (LSCS) and one was medical termination of pregnancy. The gravida, parity and gestational ages of the pregnant women are described in table 1. The surgeries performed, urgency grade of Lucas for the LSCS, [4] and New York Heart Association (NYHA) classes for the patients having cardiac diseases are also shown in table 1.

Table 1: Demographic, obstetrical and functional status distributions of the cohort

	Mean ± SD / n (%)	**95% CI**
Age (years) [N=22]	26.18 ± 4.78	24.05 – 28.30
Emergency LSCS	19 (86.36)	
Routine LSCS	2 (9.09)	
MTP	1 (4.55)	
Gravida [N=22]	1.72 ± 1.20	1.19 – 2.26
Primigravida	13 (59.09)	
Multigravida	09 (40.91)	
Parity [N=22]	0.45 ± 0.73	0.127 – 0.78
Nulliparous	15 (68.18)	
Primiparous	04 (18.18)	
Multiparous	03 (13.64)	
Gestational age for all (weeks)	36.68 ± 6.60	33.75 – 39.61
Gestational age for LSCS (weeks)	38. 0 ± 2.38	36.91 – 39.08
Urgency grade of Lucas	2.42 ± 0.87	2.03 – 2.82
1	3 (14.28)	
2	8 (38.10)	
3	8 (38.10)	
4	2 (9.52)	
NYHA for cardiac patients [N=18]	2.05 ± 0.93	1.58 – 2.52
I	6 (33.33)	
II	6 (33.33)	
III	5 (27.78)	
IV	1 (5.56)	
ASA status [N=22]	2.72 ± 0.82	2.36 – 3.09
1	0	
2	11 (50)	
3	6 (27.27)	
4	5 (22.73)	
5	0	

(SD- standard deviation, CI – confidence interval, LSCS – lower segment cesarean section, MTP- medical termination of pregnancy, NYHA – New York Heart Association, ASA – American Society of Anesthesiologists, N – total number, n - number)

Nineteen out of the 22 pregnant women were having co-existing cardiac disease while rest 3 (13.63%) were having vascular disease and rheumatic fever. 16 (76.19%) out of 21 LSCS patients were having one or more obstetrical comorbidities. The cardiovascular and obstetrical comorbidities are mentioned in **Table 2**. Only 16 patients' data with regard to pulmonary artery hypertension could be found and expressed as ordinal data in table 2.

Table 2: cardiovascular and obstetrical comorbidities of the cohort

Comorbidities	Number (%)
Valvular heart disease	10 (45.45)
Vascular disease	02 (9.09)
Congenital heart disease	10 (45.45)
Active	08 (36.36)
Post operative	02 (9.09)
Cardiomyopathy	01 (4.55)
Other	01 (4.55)
+/ - Pulmonary arterial hypertension [N=16]	
Mild	7 (43.75)
Moderate	4 (25.00)
Severe	5 (31.25)
+/- Reversal shunt (right to left)	2
Obstetric comorbidity / morbidity* [N=21]	
Oligohydramnios	05 (23.81)
Previous LSCS	02 (9.52)
Pregnancy induced hypertension	01 (4.76)
Cholestatsis of pregnancy	02 (9.52)
Cephalo pelvic disproportion	01 (4.76)
Post dated pregnancy	02 (9.52)
Fetal distress / meconium stained liquor	02 (9.52)
Breech presentation	02 (9.52)
Non progress of labor	02 (9.52)
Other medical comorbidity [N=22]	5 (22.73)
Hypertension	3 (13.64)
Hyperthyroidism	1 (4.55)
Hypothyroidism	1 (4.55)

(LSCS – lower segment cesarean section, *one patient is having one or more comorbidities)

15 (68.18%) of the surgical procedures were performed under subarachnoid blocks (SAB); 4 (18.18%) were under general anesthesia (GA), and 3 (13.64%) were done under epidural anesthesia. The notable hemodynamic changes are noted in **table 3**. There was no significant difference among them (p >0.05) taking GA as standard.

Table 3: Comparison of maternal hemodynamics and gross fetal outcome taking GA as standard

Parameters	GA n (%)	SAB n (%)	P value	Epidural n (%)	P value
Fall of BP > 20%	2 (50)	9 (60)	1.00	1 (33.33)	1.00
Fall of HR > 20%	1 (25)	10 (66.67)	0.262	1 (33.33)	1.00
Vasopressor used	2 (50)	10 (66.67)	0.262	2 (66.67)	1.00
Raise of HR > 20%	2* (50)	?1 (6.67)	0.097	1 (33.33)	1.00
APGAR <7 in 1 minute	None	None	--	None	---

(BP – blood pressure, HR – heart rate, GA – general anesthesia, SAB – subarachnoid block, EA- epidural anesthesia, n – number, *at the time of laryngoscopy, #one patient required one or more doses)

Most of the patient needed post operative high dependant unit care, one patient developed mild pulmonary edema and no maternal mortality was noted. All the babies were born with APGAR > 7 at 1 min, while all except one baby cried immediately after birth. One baby was shifted to NICU for further observation. Arterial blood pressure was monitored in half of the patients while central venous pressure line was used in few cases. No patient was managed using pulmonary artery catheter or continuous cardiac output monitoring.

4. Discussion

There is no doubt that cardiovascular disease as comorbidity is a major contributor to perinatal maternal mortality. Mortality rate in pregnant women with cardiac disease had been reported from 1.73 – 15% depending on the presenting functional NYHA class. [5-7] Cardiovascular disease and cardiomyopathy contributes to nearly 25% of maternal mortality in United States. [8] However, this mortality includes both for vaginal delivery as well as cesarean sections. Data with regard to only cesarean sections are relatively less in literature. A recent study which reviewed the management of pregnant patients with pulmonary hypertension managed in a tertiary care hospital had found no mortality among 19 pregnancies. 11 out of these patients were delivered by LSCS and six patients had severe pulmonary hypertension. [9]

One of the major apprehension and aim of perioperative management of such patient is monitoring and maintaining hemodynamics. The Task Force from European Society of Cardiology for the management of cardiovascular disease in pregnancy recommends that maternal risk assessment should be carried out according to the modified World Health Organization (WHO) risk classification and the high risk group (i.e. women in WHO class III and IV needs intensive specialist, cardiac and obstetric monitoring throughout the pregnancy, labor and puerperium. [10, 11] The need for cardiac / hemodynamic monitoring in obstetric patient may be both because of obstetric and non obstetric cause in critical care as well as in perioperative setting and cardiovascular coexisting disease is a potential indication for hemodynamic monitoring of such patients. [10-13] However, these monitoring are costly, needs good infrastructure and rarely available in health care set ups of developing countries; where most of the deliveries take place and rheumatic heart disease is widely prevalent.

In the present cohort, elective patients were evaluated with transthoracic echocardiography and most of the patients were managed with invasive blood pressure monitoring along with standard ASA monitoring without any mortality. Study conducted by Monagle et al., also found similar results in 11 LSCS in patients with pulmonary artery hypertension.[9] There is no doubt that these patients needs intensive monitoring and management in perioperative or peripartum period; yet, successful conduction of all the cases including 2 cases with shunt reversal and one case of cardiomyopathy with poor left ventricular function without continuous cardiac output or pulmonary artery catheterization (PAC) also indicates that absence of such facility and expertise should not be the only reason to refer such cases to a higher centre and probably most of such cases can be done in centre with an arterial and/or central venous pressure monitoring line and ICU backup in the same hospital or nearby. While there are reports of using PACs, [9] it is probably not a must. A PubMed and Google Scholar search based review of literature on hemodynamic monitoring in perioperative and critical care management of obstetric patients also concluded that noninvasive or minimally invasive hemodynamic monitoring appears to be equally effective to invasive techniques. [12] Transthoracic echocardiography (TOE) allows for a comprehensive evaluation of cardiac structure and function when compared to pulmonary artery catheterization. [14] However, TOE was also not used in any of the patients in present cohort.

GA is believed to provide a stable hemodynamic course, if the cardiovascular effects associated with laryngoscopy, intubation and oral suction are minimized. However, obtunding / minimizing the hemodynamic effect of laryngoscopy / intubation by either reducing time of laryngoscopy or giving drugs like opioids are not so straight forward in pregnant patients as difficult airway and *in-utero* fetus is always a concern here. EA are also an attractive options but not feasible in real emergency situation if it had not been placed beforehand for labor analgesia. SAB has also established itself as a safe anesthetic procedure even in patients having moderate to severe pulmonary hypertension. [9] In the present cohort, there was no mortality in any of GA, EA or SAB group. One case of mild pulmonary edema was noted in one patient; who recovered well with oxygen, diuretics and other supportive measures.

Oxytocin use is usually not encouraged and it is said that haemodynamic changes associated with delivery per se may be minor compared with those due to oxytocin bolus and bolus should be avoided. [15, 16] If it is used, continuous infusion is preferred. [17, 18] Ergometrine should also be avoided in severe cardiac disease, as it leads to vasoconstriction and hypertension and increases the risks of MI and pulmonary edema. In the present study cohort, oxytocin was used after delivery in all patients as a continuous infusion added in intravenous fluid. Hypotension and fall of heart rate was found to be highest in SAB; while, rise in heart rate was noted in GA patients during laryngoscopy probably due to laryngoscopy reflex. However, these changes were not statistically different. Phenylephrine 100 mcg as bolus was used to treat hypotension mostly, but Mephentermine 6 mg bolus was also used. Hemodynamic data were not from electronic database; rather from manual entry and graphic representations. So, exactness and entry bias is also possible. However, data comparison do suggests that SAB can be used in such patients safely.

The present study and conclusion is however weakened by the retrospective nature of the study with low samples. Even one next patient or foetus having unwanted outcome will give a mortality figure which can be regarded as high.

5. Conclusion

Most of the pregnant women with cardiovascular co-morbidity can be managed with minimally invasive or non-invasive hemodynamic monitoring and probably can be taken up in secondary care set ups. However, nearby facility or connection to a centre with postoperative multidisciplinary management in a HDU/ICU should be there in plan beforehand. Neuraxial anesthesia can be safely used in such cases.

References

[1] Centre for Maternal and Child Enquiries (CMACE). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. *BJOG* 2011; 118(Suppl. 1):1–203.

[2] Berg CJ, Callaghan WM, Syverson C, Henderson Z. Pregnancy-related mortality in the United States, 1998 to 2005. *Obstet Gynecol* 2010; 116:1302-9.

[3] Silverside CK, Colman JM. Physiological changes during pregnancy. In: Oakley C, Warnes CA, editors. Heart Disease in Pregnancy, 2nd edn. Oxford: Blackwell; 2007.pp. 6–17

[4] Lucas DN, Yentis SM, Kinsella SM, et al. Urgency of caesarean section: a new classification. *J R Soc Med* 2000; 93:346-50.

[5] Feitosa HN, Moron AF, Born D, de Almeida PA. Maternal mortality due to heart disease. *Rev Saude Publica* 1991; 25:443-51.

[6] Hibbard LT. Maternal mortality due to cardiac disease. *Clin Obstet Gynecol* 1975; 18:27–36.

[7] Jindal UN, Dhall GI, Vasishta K, Dhall K, Wahi PL. The effect of maternal cardiac disease on perinatal outcome. *Aus NZ J Obstet Gynecol* 1988; 28:113–5.

[8] Centre for Disease Control and Prevention. Pregnancy Mortality Surveillance System. Atlanta, USA: U.S. Department of Health & Human Services; 21st Jan 2016. [Cited 2016 Sept 4]. Available from: http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html

[9] Monagle J, Manikappa S, Ingram B, Malkoutzis V. Pulmonary hypertension and pregnancy: The experience of a tertiary institution over 15 years. *Ann Card Anaesth* 2015; 18:153-60.

[10] Regitz-Zagrosek V, Blomstrom Lundqvist C, Borghi C, Cifkova R, Ferreira R, Foidart JM, et al. ESC Guidelines on the management of cardiovascular diseases during pregnancy: the task force on the management of cardiovascular diseases during pregnancy of the European Society of Cardiology (ESC). *Eur Heart J* 2011; 32:3147–97.

[11] Thorne S, MacGregor A, Nelson-Piercy C. Risks of contraception and pregnancy in heart disease. *Heart* 2006; 92:1520–5.

[12] Karim HMR, Mitra JK, Bhattacharyya P, Roy J. Significance of hemodynamic monitoring in perioperative and critical care management in obstetric practice. *Astrocyte* 2015; 1:295-300. doi: 10.4103/2349-0977.161623

[13] Fujitani S, Baldisseri M R. Hemodynamic assessment in a pregnant and peripartum patient. *Crit Care Med* 2005; 33[Suppl]:S354–61.

[14] Ghosh, S.B.L., Sabry, A. Anaesthetic considerations for patients with severe aortic stenosis. In: D.P. Santavy (editor) Aortic Valve Stenosis—Current View on Diagnostics and Treatment. InTech, Rijeka, Croatia; 2011:67–84.

[15] Langesæter E, Gibbs M, Dyer RA. The role of cardiac output monitoring in obstetric anesthesia. *Curr Opin Anaesthesiol* 2015; 28:247-53.

[16] Shaikh SI, Lakshmi RR, Hegade G. Perioperative anesthetic management for cesarean section in patients with cardiac disease. *Anesth Pain & Intensive Care* 2014; 18:377-85.

[17] Burt CC, Durbridge J. Management of cardiac disease in pregnancy. *Contin Educ Anaesth Crit Care Pain* 2009; 9:44 – 7.

[18] Tamhane P, O'Sullivan G, Reynolds F. Oxytocin in parturients with cardiac disease. *Int J Obstet Anesth* 2006; 15:332 – 3.