



ANAESTHESIA MANAGEMENT IN PARTURIENTS WITH CARDIAC DISORDER UNDERGOING CAESAREAN SECTION- AN OBSERVATIONAL STUDY

Anaesthesiology

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ABSTRACT

Aim- To know the commonest Anaesthesia practices in cardiac patients for caesarean section. Perioperative anaesthesia management and its outcome in mother and baby. **Methodology-** Retrospective and Prospective Observational Study conducted for duration of 2 years. Written informed consent in prospective arm of the study. Waiver of consent was obtained for retrospective data from medical records. Demographic data- Age, weight, height, body mass index (BMI), cardiac disease, Modified World Health Organisation (WHO) risk, American society of Anaesthesia (ASA) classification. The anaesthesia techniques- Regional/ General Anaesthesia and maternal and fetal outcome. The above data was collected and analysed. **Results-** 62 patients were categorized according to modified WHO classification. Amongst them, 28 cases (45.2%), 12 cases (19.4%), 9 cases (14.5%), 3 cases (4.8%), 10 cases (16.1%) belonged to Class I, Class II, Class II-III, Class III and Class IV respectively. The incidence of RHD was found to be 37.1% and Peripartum cardiomyopathy as the second most common cardiac disease found in obstetric patients. The preferred anaesthesia techniques in modified WHO classification Class I, II and II-III was regional anaesthesia. General anaesthesia (GA) was a choice in cardiac comorbidities with Pulmonary hypertension (PH). Class III- 33.33% of patients received GA, Subarachnoid block (SAB), Combined Spinal and Epidural (EA +SAB) each. In Class IV, 50% underwent EA + SAB, 40% of patients received GA. **Conclusion-** Central Neuraxial blockade was preferred in Class I & II patients whenever possible. GA was preferred in class III & IV. However, the plan of Anaesthesia depends on the individual rather than universalisation to all the cardiac conditions.

KEYWORDS

Parturient, Cardiac diseases, Caesarean section.

INTRODUCTION-

Pregnant patients with heart disease are a unique challenge to the Obstetricians and Anaesthesiologists. High risk parturient require a thorough understanding of the impact of pregnancy on the haemodynamic response to the patient's cardiac lesion. Common cardiac lesions seen during pregnancy in our population range from Congenital Cardiac defects to Peripartum Cardiomyopathy. Still Rheumatic heart disease (RHD) at present is the most common cardiac disorder in pregnancy, with Mitral Stenosis (MS) as a single most prevalent lesion in developing countries. In developing countries with a higher prevalence of Rheumatic fever, cardiac disease may perhaps complicate as many as 5.9% of pregnancies with a high incidence of maternal death.^[1] Modified WHO cardiac risk assessment classification gives more knowledge towards decision making and management and is considered best in estimating cardiovascular risk in pregnant women (Figure 1).^[2]

Risk Class	Risk of Pregnancy	Conditions Corresponding to Risk Class
I	No detectable increased risk of maternal morbidity and mortality	Risk class I Uncomplicated, small or mild pulmonic stenosis, patent ductus arteriosus, mitral valve prolapsed Successfully repaired simple lesions (eg, atrial septal defect, ventricular septal defect, patent ductus arteriosus) Isolated ventricular or atrial ectopic beats
II	Small increased risk of maternal morbidity and mortality	Risk class II Unoperated atrial septal defect or ventricular septal defect Repaired tetralogy of Fallot Most arrhythmias Risk class II or III (depending on individual) Mild left ventricular impairment Hypertrophic cardiomyopathy Native or tissue valvular disease not considered WHO class I or IV Marfan syndrome without aortic dilation Repaired coarctation
III	Significant increased risk of maternal morbidity and mortality	Risk class III Mechanical valve Systemic right ventricle Fontan circulation Cyanotic heart disease Other complex congenital heart disease Aortic dilation 40-45 mm in Marfan syndrome
IV	Extremely high risk of maternal mortality and severe morbidity; pregnancy is contraindicated	Risk class IV Pulmonary artery hypertension of any cause Previous peripartum cardiomyopathy with residual impairment Severe systemic ventricular dysfunction (LVEF < 30%, NYHA III or IV) Marfan syndrome with a dilated aorta >45 mm Native severe coarctation

Abbreviations: WHO, World Health Organization; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

Figure 1: Modified WHO cardiac risk assessment classification in Pregnant women.^[2]

Prof Emanuele Di Angelantonio et al. concluded the widespread use could enhance the accuracy, practicability, and sustainability of effort to reduce the burden of cardiovascular disease worldwide.^[3] It is difficult to have standard protocols for managing different cardiac pathophysiology in different diseases as the same in all conditions. Individualisation as per case and symptoms of the patient is required. The aim of this study is to know the commonest Anaesthesia practices, efficacy of each type of Anaesthesia technique and its outcome in mother and fetus.

MATERIALS AND METHODS-

A Retrospective and Prospective Observational Study was conducted in tertiary care hospital in pregnant women with heart disease undergoing Caesarean section from August 2019 to August 2021 for duration of 2 years, after ethics committee approval. In Prospective arm, written informed consent was taken prior to recruitment of patients for study. The waiver of consent was obtained for retrospective arm and data was collected from medical and anaesthesia case record forms from medical record section. All patients with diagnosed cardiac disease were included while unwilling patients, arrhythmias of non-cardiac origin, cardiac disorder post Pregnancy induced hypertension (PIH), septicemia and massive blood loss were excluded from the study. In both Prospective and Retrospective arm, the following data was included:

Demographic data -

Age, weight, height, BMI, cardiac disease, Modified WHO risk, ASA classification for cardiac disorder in pregnancy were noted.

Anaesthesia techniques-

General Anaesthesia, Regional anaesthesia- SAB, Epidural, EA + SAB.

Haemodynamic monitoring-

Pulse rate, Blood Pressure, SpO₂, Respiratory rate, were noted. Necessity of invasive monitoring like central venous pressure and/ or intra-arterial pressures, use of inotropes were noted.

Postoperatively whether shifted to ward or ICU was noted. Any events such as cardiac failure, arrhythmias and other complications were noted. Outcome of the baby recorded by noting APGAR score at 1 minute and 5 minutes.

By compiling the above collected data, the results were drawn. The data was analysed using SPSS Version 21. Prevalence as per Marina et al is 4.1 and using this with 95% confidence interval and 5% absolute error, we calculated the minimum sample size to be 62. Quantitative variables represented as Mean $\pm$ SD, or median (interquartile range). The minimum and maximum values of such variables mentioned. Qualitative variables represented as frequencies and percentages.

RESULTS-

In total 62 patients' data was collected. 38.7% of patients were in the age group of 21-25 years with a mean age of 28.30 years. Mean weight and height of study population was found to be 31.5 kg and 151.79 cms respectively. Mean BMI was 28.30 kg/m²

Table 1: Incidence (%) of Cardiac Disorders in the study population(n=62)

Diagnosis	No. of Cases	Percentage
Congenital	Post ASD closure	6 9.6%
	TOF (post operated)	3 4.8%
	Ebstein anomaly	1 1.6%
Acquired	RHD	23 37.1%
	Functional Abnormality	8 12.9%
	Cardiomyopathy	8 12.9%
	Pulmonary hypertension	3 4.8%
	Takayasu arteritis	3 4.8%
	Mitral valve prolapse	2 3.2%
	Lupus carditis	1 1.6%
	LVD	1 1.6%
	LVH	1 1.6%
	NSTEMI	1 1.6%
	Sclerotic aortic valve	1 1.6%

In our study, the incidence of RHD was found to be 37.1% and Peripartum cardiomyopathy as the second most common cardiac disease found in obstetric patients. 46.8% (29 cases) were already diagnosed cases of cardiac disease before pregnancy forming majority in our study population. 37.1% (23 cases) were diagnosed at the Antenatal visits. ASA physical status I, II, III and IV were 13%, 6%, 69%, 11% respectively.

Modified WHO (Figure 2) Class I were very low risk category 45.2% of the study population, 19% class II were low to moderate risk category, only 3 cases of class III high risk category however 10 cases (16%) were to be found under extremely high-risk class.

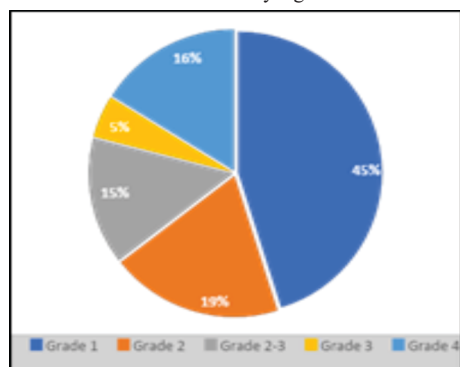


Figure 2: Modified WHO Class

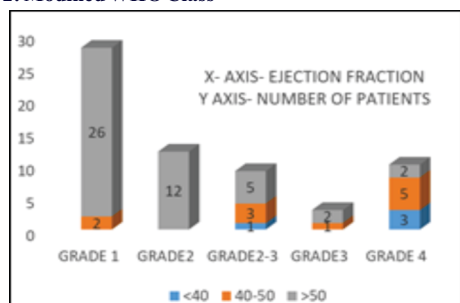


Figure 3: Ejection fraction & WHO grading

Cases with **Ejection fraction (EF) (Figure 3)** <40% was 6.45% in all, out of which 3 cases belongs to class IV and 1 case to class II-III. 75.8% of the study population had good EF out class I, II, II-III, III & IV were 26, 12, 5, 2 & 2 respectively.

Anaesthesia technique and WHO class -

Overall regional anaesthesia technique was preferred in 45 patients out of 62, while GA was administered in 17 patients. In class III and IV preference of GA almost parallels that of regional anaesthesia. SAB was safely used in Class I (15 pts) and class II (7 pts) but in class III and above it was least preferred method of anaesthesia. Epidural with SAB opioid or low dose intrathecal bupivacaine dose as low as 2.5mg was successfully used.

Table 2: Anaesthesia technique and WHO class -

Modified WHO class	Epidural	GA	SAB	Epidural+ SAB
I	1	7	15	5
II	-	2	7	3
II-III	-	3	4	2
III	-	1	1	1
IV	-	4	1	5
Total	1	17	28	16

Invasive Monitoring was required in 5 cases and maximum were of Class IV. The APGAR score of neonates with respect to the modified WHO class is compiled and mentioned in the above table. In Class I, II, II-III, maximum had APGAR >7 and in Class III & IV, 5 patients had APGAR 0 and rest had APGAR > 7. Considering maternal outcome, out of 62 cases there were death in two cases and both belonged to Grade IV Modified WHO Grading.

DISCUSSION-

Cardiac pathology with physiological changes in pregnancy can be detrimental in a parturient. Anaesthesia management in parturient with cardiac pathology mandates a balance in cardiac indices including ejection fraction, SVR, PVR and contractility as it alters and augments the normal physiological process occurring in pregnancy. Cardiac disease has spectrum presentation so most of the times definitive anaesthesia plan are difficult and individualisation is commonly practised.

Thus, this study was conducted to have knowledge of commonly practiced anaesthesia techniques used in various cardiac conditions, intraoperative management, any maternal and fetal complications. 37.1% of the cardiac cases were diagnosed for the first-time during pregnancy while 40.3% were primigravidas diagnosed with cardiac disease. Thus, we conclude that cardiac pathology augments the physiological changes occurring in pregnancy and thus they are commonly diagnosed during pregnancy. The results were found to be similar to a study done by Sharma et al wherein the incidence was found to be 30.13% in primigravida.^[4]

Modified WHO classification postulates the cardiovascular risk assessment in pregnant women with congenital or acquired cardiac disease. Majority of patients (45.2%) belonged to Class I (very low risk) and 16.1% of patients belonged to Class IV (extremely high risk). The goals of anaesthesia management in parturient with cardiac disease were^[1]

1. Adequate Analgesia, 2. Hemodynamic monitoring which includes – Preload, Afterload (SVR), PVR, HR and Myocardial contractility assists to optimize hemodynamic stability and plan appropriate anaesthesia management.

3. Optimize cardiovascular and respiratory function by controlling hemodynamic and tailoring anaesthesia technique for maternal and fetal well-being.

In Modified WHO Class I, Subarachnoid block was the preferred choice of anaesthesia. ASD (9.6%) cases (operated) were found to be maximum. Subarachnoid block with Inj. Bupivacaine 0.5% Heavy 2 to 2.2 ml based on the Height and weight of the individual patient with Inj. Fentanyl 10 mcg intrathecally was given. None of these patients required invasive monitoring. Majority of neonates had an APGAR score 7-10. Bengali R. Et al reported a case of atrial septal defect with pulmonary arterial pressure 45 mmHg underwent Caesarean section successfully under Epidural Anaesthesia with 0.5% Ropivacaine with good maternal and fetal outcome.^[5]

In **Modified WHO Class II**, Subarachnoid block was found to be preferred choice of anaesthesia for these patients. Cases of repaired Tetralogy of Fallot (TOF) were found to be maximum. Gamze et al. reported a case of corrected TOF under epidural anaesthesia with good cardiovascular stability.^[6] In a study done by Baidya D K et al uncorrected TOF was done with low dose Spinal with Epidural Anaesthesia with good maternal and fetal outcome.^[7] General Anaesthesia was avoided as it reduces Systemic vascular resistance. Thus, to conclude, Class I and II are either corrected cardiac pathology or grown-up congenital heart disease which were successfully performed under regional anaesthesia. All neonates had an APGAR of 7-10.

Nine cases in **Modified Class II-III**. Valve lesions with rheumatic disease were 5. Central neuraxial blockade was preferred form of anaesthesia with good postoperative outcome. GA was given for obstetric reasons in 2 of the 3 patients in this group of patients. Peripartum cardiomyopathy with EF > 30% were also included in class II-III with an incidence of 6.4% and were performed under regional anaesthesia with subarachnoid block. Takayasu arteritis with mild mitral stenosis were successfully done under subarachnoid block. Neonatal outcome was good in all patients. The reason for this could be regional anaesthesia assisted in avoiding airway manipulation and stress response to laryngoscopy, allowing spontaneous respiration with little disruption of V/Q ratio. Subarachnoid block (Low dose- 2.5-5 mg) was preferred as it was quick to perform, faster in onset of action and also it was associated with lesser hemodynamic fluctuations compared to conventional SAB. APGAR scores were better with regional anaesthesia. However, regional anaesthesia was not implemented in fixed low cardiac output states (severe stenotic lesions) and Eisenmengerization^[8].

Wu et al conducted a retrospective study on 48 cases with RHD with MS were successfully managed with Epidural Anaesthesia with no maternal or fetal complications.^[9] Cole MR et al reported a case of undiagnosed mixed mitral valve disease presented for Caesarean section and was successfully performed under subarachnoid block.^[10]

In **modified WHO Class III**, 33.33% of patients received GA, SAB, EA + SAB each. A case of Ebsteins anomaly with AF with fetal distress was performed under general anaesthesia. Gite JV reported a case of primigravida with NYHA class II and Ebstein's anomaly with severe tricuspid regurgitation for emergency lower segment Caesarean section which was managed successfully with Epidural Anaesthesia.^[11] Invasive lines were inserted in Dilated cardiomyopathy (DCM) with >30% EF. Two neonates had an APGAR of 0 wherein regional anaesthesia was administered however hemodynamics were stable peroperatively.

Cases of PH with an incidence of 4.8% and DCM with low EF < 30% with an incidence of 6.4% were commonly found in modified WHO Class IV. Combined Epidural and Subarachnoid block was preferred, 40% of patients received GA. Invasive monitoring with IBP, CVP and CVP + IBP was required in those with low EF and high PH. Majority had an APGAR of 7-10. McIndoe AK et al reported a case of peripartum cardiomyopathy for emergency Caesarean section in view of fetal bradycardia induced successfully with GA.^[12] Fukuda et al successfully managed a 23-year-old pregnant patient with DCM using Epidural anaesthesia^[13]

Valvular heart disease with RHD was found to be the most common heart disease among the study subjects with an incidence of 37.1%. Mitral stenosis was found as the commonest cause of RHD with an incidence of 60% (14 cases). Mitral stenosis with Mitral regurgitation was the second most common cause of RHD with an incidence of 39% (9 cases).

Thus, it was observed that as the modified WHO grading increases the choice of anaesthesia is switched over to GA. GA with endotracheal intubation helps in airway protection, eliminates the work of breathing and reduces the oxygen consumption thereby improving the arterial oxygen content. Also, it avoids sympatholysis. It was specifically preferred in patients with cardiac failure, on anticoagulation, right to left shunt, fixed cardiac output and coarctation of aorta.^[7] As the risk of myocardial depression continues with GA, titrated anaesthetic drugs were administered. Invasive monitoring such as CVP and IBP were done in these patients to predict and prevent the occurrence of cardiac event. In specific patients hemodynamic monitoring was continued in postoperative period. APGAR scores were better.

The successful management of parturient with cardiac disease incorporates thorough preoperative evaluation, antepartum counselling, risk stratification, optimization, hemodynamic monitoring and tailored anaesthesia plan.

CONCLUSION-

The modified WHO classification is valuable in not only procuring a cardiovascular risk assessment in pregnant women but also for predicting adverse fetal outcomes. Central Neuraxial blockade was preferred for Caesarean delivery in Class I & II patients whenever possible. GA was preferred in class III & IV. However, the plan of Anaesthesia depends on the individual rather than universalisation to all the cardiac conditions. Also, ANC visits are important to improve the both maternal and fetal outcome with proper optimisation and multi expert discussions. Careful preanesthetic evaluation of the cardiac patients, proper plan of anaesthesia and adequate preparation would help us in conduct of safe anaesthesia.

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