CrossMark

MATERNAL-FETAL MEDICINE

Maternal and fetal outcome in women with rheumatic heart disease: a 3-year observational study

Mohamed Rezk[1] · Awni Gamal[2]

Abstract

Objective   To assess prospectively the maternal and fetal outcome in women with rheumatic heart disease (RHD).

Methods   This was a prospective 3-year observational study carried out at Menoufia University Hospital, Egypt in which 192 patients out of 9856 pregnant women were diagnosed with RHD and divided into two groups: low- and high-risk groups based on the New York Heart Association (NYHA) functional classification. Enrolled patients were followed to assess the maternal and fetal outcome.

Results   Mitral valve disease was the commonest single valve (118/192, 51.4 %) affected by rheumatic fever. Cardiac women with NYHA class I&II characterized by having fewer pulmonary hypertension, taking cardiac medications, prior heart failure and prior cardiac surgery than those with NYHA class III&IV. On the hand, cardiac women with NYHA III&IV have poorer maternal outcome with more complications as heart failure, arrhythmias, thromboembolism, admission to cardiac ICU, delivery by cesarean section and defective lactation. Prematurity and NICU admission were significantly more in NYHA III&IV.

Conclusions   RHD still constitutes a major cause of maternal and fetal morbidity and mortality. Multidisciplinary cooperation, proper preconception and antenatal care are the key measures to improve the outcomes of these patients.

Keywords   Rheumatic heart disease · Pregnancy outcome · Maternal mortality

Introduction

Cardiac diseases occur in 2–4 % of pregnancies and rheumatic mitral disease is the most common acquired heart disease in pregnancy [1].

Rheumatic heart disease (RHD) is a chronic acquired heart disorder resulting from acute rheumatic fever. In developing countries, RHD continues to be a major cause of cardiac morbidity and mortality especially among young adult females [2, 3].

In the presence of maternal heart disease, the circulatory changes of pregnancy may result in decompensation or death of the mother and/or the fetus [4].

There are few prospective studies in the literature that assessed the obstetric outcome in women with RHD.

The aim of this study was to assess prospectively the maternal and fetal outcome in women with RHD.

Materials and methods

This was a prospective observational study carried out at the Department of Obstetrics and Gynecology in collaboration with the Cardiology department at Menoufia University Hospital between May 2012 and May 2015.

The institutional review board approved the study protocol and an informed consent was obtained from all participants prior to commencing the study.

✉ Mohamed Rezk
   m_rezk9207@yahoo.com;
   Mohamed.abdallah1975@yahoo.com

[1]   Department of Obstetrics and Gynecology, Faculty of Medicine, Menoufia University, Shibin Elkom, Menoufia, Egypt

[2]   Department of Cardiology, Faculty of Medicine, Menoufia University, Shibin Elkom, Menoufia, Egypt

Pregnant women diagnosed with rheumatic heart disease attending either the antenatal care or Cardiology outpatient clinics were included in the study. Rheumatic heart disease was diagnosed on the basis of clinical history with long-acting penicillin intake or cardiac symptoms preceding pregnancy and cardiac evaluation including electrocardiography (ECG) and echocardiography performed at Cardiology department.

Women with congenital or ischemic heart disease, women having other associated medical disorder as diabetes mellitus, bronchial asthma and epilepsy and pregnancies complicated by fetal malformations were excluded from the study.

Enrolled women were followed up from the time of diagnosis of RHD till the end of the puerperium and received the standard management at the hospital which included frequent antenatal visits every 1–3 weeks in the outpatient clinic, to be seen every time by obstetrician and cardiologist. For better follow-up, we divided our patients into two groups low risk group (NYHA I&II) and high risk group (NYHAIII&IV) based on the New York Heart Association (NYHA) functional classification (1994):

NYHA-I: No symptoms and no limitation in ordinary physical activity.
NYHA-II: Mild symptoms and slight limitation during ordinary physical activity.
NYHA-III: Marked limitation in activity, even during less than ordinary activity. Only comfortable at rest.
NYHA-IV: Severe limitations, symptoms even at rest.

Outcome measures

- *Maternal outcome*: development of heart failure, sustained arrhythmias, thromboembolism, infective endocarditis, mode of delivery, admission to cardiac intensive care unit (ICU), postpartum hemorrhage, defective lactation and maternal mortality. Assessment of progression of RHD was based on NYHA class and hemodynamic changes in echocardiography principally trans-valvular pressure gradient in stenotic lesions.
- *Fetal-neonatal outcome*: small for gestational age (SGA) defined as a birth weight <5th percentile, preterm labour (delivery <37 weeks), intrauterine fetal demise (IUFD), admission to neonatal intensive care unit (NICU) and neonatal death (defined as death during the first 4 weeks after delivery).

Statistical analysis

The data collected were tabulated and analyzed by SPSS (statistical package for the social science software) statistical package version 20 on personal compatible computer.

Quantitative data were expressed as mean and standard deviation (X ± SD) and analyzed by applying student t-test for comparison of two groups of normally distributed variables and two groups of not normally distributed variables by applying Mann–Whitney test.

Qualitative data were expressed as number and percentage (No and %) and analyzed by applying Chi-square test and for 2×2 table and one cell has expected number <5 Fisher's exact test was applied.

All these tests were used as tests of significance at:

- P value > 0.05 was considered statistically non-significant.
- P value ≤ 0.05 was considered statistically significant.
- P value ≤ 0.001 was considered statistically highly significant.

Results

Out of 9856 pregnant women attending the antenatal care outpatient clinic during the study period, 246 (2.5 %) women with cardiac disease were enrolled, with 54 women being excluded, 42 women with congenital heart disease and 12 women with associated medical disorder as DM, bronchial asthma and epilepsy (Fig. 1).

Table 1 reveals the maternal characteristics. Cardiac women with NYHA class I&II characterized by being older, multiparous with later booking and fewer antenatal care visits in comparison to those with NYHA class III&IV.
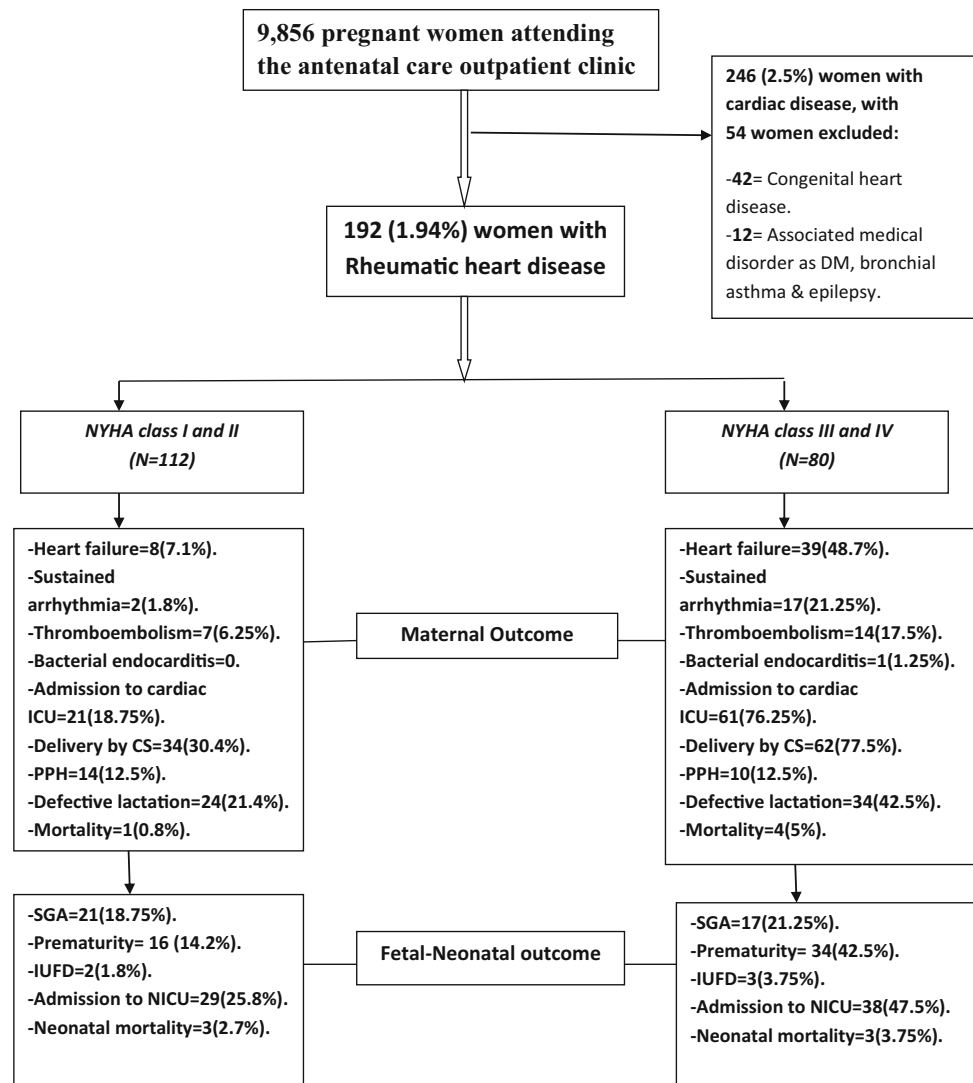
Table 2 shows the criteria of cardiac disease among the participants. Mitral valve disease was the commonest single valve (118/192, 51.4 %) affected by rheumatic fever followed by the aortic valve (53/192, 27.6 %), followed by other lesions. Cardiac women with NYHA class I&II characterized by having fewer pulmonary hypertension, taking cardiac medications, prior heart failure and prior cardiac surgery than those with NYHA class III&IV.

Table 3 reveals the maternal outcome. Cardiac women with NYHA III&IV have poorer maternal outcome with more complications as heart failure, arrhythmias, thromboembolism, admission to cardiac ICU, delivery by cesarean section and defective lactation when compared to those with NYHA I&II.

Table 4 reveals the fetal-neonatal outcome. Prematurity and NICU admission were significantly more in NYHA III&IV in comparison to NYHA I&II with no significant difference in IUFD and neonatal death.

Discussion

In our study, the incidence of cardiac disease complicating pregnancy was 2.5 % which is consistent with previous studies [1, 4, 5].

Fig. 1 The flow diagram

9,856 pregnant women attending the antenatal care outpatient clinic

246 (2.5%) women with cardiac disease, with 54 women excluded:

-42= Congenital heart disease.

-12= Associated medical disorder as DM, bronchial asthma & epilepsy.

192 (1.94%) women with Rheumatic heart disease

NYHA class I and II (N=112)

NYHA class III and IV (N=80)

Maternal Outcome

-Heart failure=8(7.1%).
-Sustained arrhythmia=2(1.8%).
-Thromboembolism=7(6.25%).
-Bacterial endocarditis=0.
-Admission to cardiac ICU=21(18.75%).
-Delivery by CS=34(30.4%).
-PPH=14(12.5%).
-Defective lactation=24(21.4%).
-Mortality=1(0.8%).

-Heart failure=39(48.7%).
-Sustained arrhythmia=17(21.25%).
-Thromboembolism=14(17.5%).
-Bacterial endocarditis=1(1.25%).
-Admission to cardiac ICU=61(76.25%).
-Delivery by CS=62(77.5%).
-PPH=10(12.5%).
-Defective lactation=34(42.5%).
-Mortality=4(5%).

Fetal-Neonatal outcome

-SGA=21(18.75%).
-Prematurity= 16 (14.2%).
-IUFD=2(1.8%).
-Admission to NICU=29(25.8%).
-Neonatal mortality=3(2.7%).

-SGA=17(21.25%).
-Prematurity= 34(42.5%).
-IUFD=3(3.75%).
-Admission to NICU=38(47.5%).
-Neonatal mortality=3(3.75%).

Table 1 Maternal characteristics

	Group 1 NYHA I&II (n = 112)	Group 2 NYHA III&IV (n = 80)	Student t test	P value
Age (in years)	24 ± 3.6	23 ± 3.2	1.99	<0.05
Parity	2.36 ± 1.1	0.75 ± 0.54	U = 12.09	<0.001
BMI	21 ± 1.2	21 ± 1.3	0.36	>0.05
G.A. at booking	13 ± 3.2	8 ± 2.2	12.08	<0.001
Number of ANC visits	6 ± 1.8	10 ± 2.3	13.51	<0.001
Late booking (after 12 weeks)	68 (60.7 %)	18 (22.5 %)	5.1*	<0.001

* Chi-square, *U* Mann–Whitney test, *BMI* body mass index, *G.A.* gestational age, *ANC* antenatal care

RHD complicates about 0.3–3.5 % of women in the childbearing period with global figure around 1 %. It accounts for about 30 % of cardiac disease during pregnancy in developed countries and about 90 % of cardiac disease in non-industrialized regions [6, 7].

Mitral valve disease was the commonest lesion in this study affecting 118 patients out of 192 (51.4 %) followed by the aortic valve (53/192, 27.6 %), followed by other lesions, with 112 women with NYHA class I&II and 80 women with NYHA III&IV. Cardiac women with NYHA

Table 2 Criteria of cardiac disease

	Group 1 NYHA I&II (n = 112)	Group 2 NYHA III&IV (n = 80)	Chi-square	P value
Valve lesions				
Mitral valve	66 (58.9 %)	52 (65 %)	0.24	>0.05
Aortic valve	34 (30.4 %)	19 (23.8 %)	0.19	>0.05
Tricuspid valve	2 (1.8 %)	2 (2.5 %)	0.42[a]	>0.05
Combined lesions	10 (8.9 %)	7 (8.7 %)	0.41	>0.05
Pulmonary artery hypertension	17 (15.2 %)	72 (90 %)	10.1	<0.001
Receiving cardiac medications				
None	72 (64.3 %)	0 (0 %)	8.92[a]	<0.001
Digoxin	9 (8.1 %)	29 (36.3 %)	4.6	<0.001
Diuretic	16 (14.2 %)	18 (22.6 %)	1.3	>0.05
Anti-arrhythmic	8 (7.1 %)	22 (27.6 %)	3.6	<0.001
Anticoagulant	7 (6.3 %)	10 (12.5 %)	1.23	>0.05
Prior heart failure	8 (7.1 %)	69 (86.2 %)	10.88	<0.001
Prior cardiac surgery	58 (51.8 %)	62 (77.5 %)	3.48	<0.001

[a] Fisher's exact test

Table 3 Maternal outcome

	Group 1 NYHA I&II (n = 112)	Group 2 NYHA III&IV (n = 80)	Chi-square	P-value
Heart failure	8 (7.1 %)	39 (48.7 %)	6.44	<0.001
Sustained arrhythmia	2 (1.8 %)	17 (21.25 %)	4.2	<0.001
Thromboembolism	7 (6.25 %)	14 (17.5 %)	2.23	<0.05
Infective endocarditis	0 (0 %)	1 (1.25 %)	0.17[a]	>0.05
Admission to cardiac ICU	21 (18.75 %)	61 (76.25 %)	7.79	<0.001
Delivery by CS	34 (30.4 %)	62 (77.5 %)	6.29	<0.001
PPH	14 (12.5 %)	10 (12.5 %)	0.22	>0.05
Defective lactation	24 (21.4 %)	34 (42.5 %)	2.98	<0.05
Maternal mortality	1 (0.8 %)	4 (5 %)	1.36[a]	>0.05

ICU intensive care unit, *CS* Cesarean section, *PPH* postpartum hemorrhage

[a] Fisher's exact test

Table 4 Fetal-neonatal outcome

	Group 1 NYHA I&II (n = 112)	Group 2 NYHA III&IV (n = 80)	Chi-square	P value
Small for gestational age	21 (18.75 %)	17 (21.25 %)	0.24	>0.05
Prematurity	16 (14.2 %)	34 (42.5 %)	4.24	<0.001
IUFD	2 (1.8 %)	3 (3.75 %)	0.38[a]	>0.05
NICU admission	29 (25.8 %)	38 (47.5 %)	2.96	<0.05
Neonatal death	3 (2.7 %)	3 (3.75 %)	0.01[a]	>0.05

IUFD intrauterine fetal demise, *NICU* neonatal intensive care unit

[a] Fisher's exact test

class I&II characterized by having fewer pulmonary hypertension, taking cardiac medications, prior heart failure and prior cardiac surgery than those with NYHA class III&IV.

The most common heart valves affected by RHD and non-RHD causes are the mitral and aortic valves, less commonly the tricuspid and rarely the pulmonary valve. Rheumatic valve disease most commonly leads to regurgitation [8, 9] and less commonly to valve stenosis or mixed regurgitation and stenosis [10]. Although the majority of rheumatic valve disease cases are only mildly affected [7], a minority progress to more severe disease requiring valve surgery [11].

Mitral stenosis (MS) remains the most common acquired valvular lesion in pregnant women and the most common cause of maternal death from cardiac causes worldwide [12].The rate of fetal morbidity, including fetal growth restriction and preterm birth, rises with the severity of MS from 14 % in pregnant patients with mild MS, to 28 and 33 % in pregnant patients with moderate and severe MS [13].

In this study, Cardiac women with NYHA III&IV have poorer maternal outcome with more complications as heart failure, arrhythmias, thromboembolism, admission to cardiac ICU, delivery by cesarean section and defective lactation when compared to those with NYHA I&II.

In a retrospective analysis including 144 pregnancies in women with cardiac disease, Perinatal and maternal outcomes were interpreted according to the type of the heart disease and status of the patient according to the New York Heart Association (NYHA) classification. There was no maternal mortality. Maternal morbidity was observed in 16 (11.1 %) cases maternal morbidity and cesarean delivery rates were significantly higher in the NYHA stage III-IV group in comparison to NYHA stage I–II group [14].

In a more recent retrospective analysis that included 100 pregnancies in women with heart disease who delivered at ≥28 weeks of gestation. Cardiac disease was found to complicate 3.8 % of pregnancies. Rheumatic heart disease (n = 64, 64 %) was the predominant cardiac disease. Fewer cardiac and postpartum complications were present in NYHA class I/II patients compared to NYHA III/IV patients [15].

In our series, there was one case of maternal mortality (0.8 %) in NYHA I&II group who admitted to cardiac ICU with atrial fibrillation and four cases of maternal mortality in NYHA III&IV group (5 %), three cases with acute pulmonary edema in whom one case was postpartum and the last one case with pulmonary embolism following delivery by cesarean section.

The percentage of pregnancies that are complicated by acute pulmonary edema has been estimated to be 0.08 % [16]. The development of pulmonary edema is easily understood when one considers the interaction between the physiological cardiovascular adjustments to pregnancy and the hemodynamics of mitral stenosis [5]. On the other hand, atrial fibrillation is a common complication of mitral valve stenosis and affects more than 40 % of cases [17].

In this study, Prematurity and NICU admission were significantly more in NYHA III&IV in comparison to NYHA I&II with no significant difference in IUFD and neonatal death.

In a retrospective analysis carried out for pregnancies in 1142 women with heart disease who delivered in China. Cardiac failure occurred in 97 (8.5 %) patients, and 8 (0.7 %) maternal deaths and 12 (1.1 %) perinatal deaths were reported. Compared with those in NHYA Class I–II, women in NHYA Class III-IV had a significantly lower gestational age at birth, lower birth weight and higher incidence of preterm delivery, small for gestational age and perinatal death [18].

RHD still constitutes a major cause of maternal and fetal morbidity and mortality. Multidisciplinary cooperation, proper preconception and antenatal care are the key measures to improve the outcomes of these patients.

Compliance with ethical standards

References

1. Arnoni RT, Arnoni AS, Bonini RC, de Almeida AF, Neto CA, Dinkhuysen JJ et al (2003) Risk factors associated with cardiac surgery during pregnancy. Ann Thorac Surg 76(5):1605–1608
2. Carapetis JR, Steer AC, Mulholland EK (2004) The current evidence for the burden of group A streptococcal diseases (WHO/FCH/CAH/05.07). World Health Organization, Geneva
3. Rheumatic fever and rheumatic heart disease: report of a WHO expert consultation—Geneva, 29 October–1 November 2001. WHO Technical Report Series 2001, p 923. http://www.who.int/cardiovascular_diseases/resources/en/cvd_trs923.pdf
4. Konar H, Chaudhuri S (2012) Pregnancy complicated by maternal heart disease: a review of 281 women. J Obstet Gynaecol India 62(3):301–306
5. Essop MR, Nkomo VT (2005) Rheumatic and nonrheumatic valvular heart disease: epidemiology, management, and prevention in Africa. Circulation 112:3584–3591
6. Siu SC, Sermer M, Colman JM et al (2001) Prospective multicenter study of pregnancy outcomes in women with heart disease. Circulation 104:515–521
7. Carapetis JR, Steer AC, Mulholland EK, Weber M (2005) The global burden of group A streptococcal diseases. Lancet Infect Dis 5:685–694

8. Remenyi B, Wilson N, Steer A, Ferreira B, Kado J, Kumar K et al (2012) World Heart Federation criteria for echocardiographic diagnosis of rheumatic heart disease—an evidence-based guideline. Nat Rev Cardiol 9:297–309

9. Enriquez-Sarano M, Akins CW, Vahanian A (2009) Mitral regurgitation. Lancet 373:1382–1394

10. Bhandari S, Subramanyam K, Trehan N (2007) Valvular heart disease: diagnosis and management. J Assoc Physicians India 55:575–584

11. Baskerville CA, Hanrahan BB, Burke AJ, Holwell AJ, Remond MG, Maguire GP (2012) Infective endocarditis and rheumatic heart disease in the north of Australia. Heart Lung Circ 21:36–41

12. Stout KK, Otto CM (2007) Pregnancy in women with valvular heart disease. Heart 93:552–558

13. Lesniak-Sobelga A, Tracz W, KostKiewicz M, Podolec P, Pasowicz M (2004) Clinical and echocardiographic assessment of pregnant women with valvular heart diseases—maternal and fetal outcome. Int J Cardiol 94:15–23

14. Madazli R, Sal V, Cift T, Guralp O, Goymen A (2010) Pregnancy outcomes in women with heart disease. Arch Gynecol Obstet 281(1):29–34

15. Subbaiah M, Sharma V, Kumar S et al (2013) Heart disease in pregnancy: cardiac and obstetric outcomes. Arch Gynecol Obstet 288(1):23–27

16. Sciscione AC, Ivester T, Largoza M et al (2003) Acute pulmonary oedema in pregnancy. Obstet Gynaecol 101(3):511–515

17. Eisenberg MJ (1993) Rheumatic heart disease in the developing world: prevalence, prevention and control. Eur Heart J 14:122–128

18. Liu H, Xu JW, Zhao XD, Ye TY, Lin JH, Lin QD (2010) Pregnancy outcomes in women with heart disease. Chin Med J (Engl) 123(17):2324–2330