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MATERNAL OUTCOMES IN PREGNANT WOMEN WITH RHEUMATIC HEART DISEASE.

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The authors have no conflicts of interest to declare.

Abstract:

Introduction: Rheumatic heart disease (RHD) is a chronic condition resulting from acute rheumatic fever (ARF), triggered by an autoimmune response to Group A Beta-hemolytic Streptococcus infection. It primarily affects heart valves, causing progressive damage and dysfunction. RHD is a major public health concern, particularly in low- and middle-income countries, where it contributes significantly to maternal and neonatal morbidity and mortality. Pregnancy exacerbates the cardiovascular strain in women with RHD, leading to increased risks of adverse outcomes. This study evaluates maternal and neonatal outcomes in pregnant women with RHD to improve care and management strategies.

Materials and methods: A retrospective cohort analysis was conducted at Sree Mookambika Institute of Medical Sciences over two years. The study included 102 pregnant women with confirmed RHD. Data on demographic details, clinical characteristics, pregnancy outcomes, maternal complications, and neonatal outcomes were collected from medical records. Statistical analysis was performed using SPSS version 26, with significance set at $p < 0.05$.

Results: The mean age of the patients was 28.4 years, with an average gestational age of 20.3 weeks at the time of study. Most patients belonged to middle (45%) or low (40%) socioeconomic status. Mitral stenosis was the predominant valvular lesion (60%), and 50% of

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patients were classified as NYHA class II. Vaginal delivery occurred in 60% of cases, with a 40% cesarean section rate. Preterm delivery (<37 weeks) was observed in 25% of cases, and low birth weight (<2500g) in 30%. Maternal complications included heart failure (20%), arrhythmias (10%), and thromboembolism (5%). Neonatal complications included NICU admissions (20%), neonatal mortality (3%), and low Apgar scores (10%).

Conclusion: Pregnant women with RHD are at significant risk for maternal and neonatal complications. The study highlights the high prevalence of mitral stenosis, the necessity of cesarean deliveries, and elevated rates of cardiac and obstetric complications. These findings emphasize the need for comprehensive management strategies to optimize outcomes. Future research should focus on larger, multicenter studies with long-term follow-up.

Keywords: *Rheumatic heart disease, pregnancy, maternal outcomes, neonatal outcomes, cardiovascular complications, valvular heart disease, preterm delivery, low birth weight.*

Introduction:

Rheumatic heart disease (RHD) is a chronic sequela of acute rheumatic fever (ARF), which arises from an autoimmune response to Group A Beta-hemolytic Streptococcus infection. This condition predominantly affects the heart valves, leading to their progressive damage and subsequent dysfunction. RHD remains a significant public health concern, particularly in low- and middle-income countries where the incidence of ARF is higher due to factors like overcrowding, poor sanitation, and limited access to healthcare. The global burden of RHD is substantial, with an estimated 33 million people affected and nearly 300,000 deaths annually[1,2].

Pregnancy imposes additional cardiovascular strain on women, which can exacerbate the underlying pathology of RHD. Physiological changes during pregnancy, such as increased blood volume, cardiac output, and heart rate, can challenge the compromised cardiac function in these women. Consequently, pregnant women with RHD are at a higher risk of adverse maternal and fetal outcomes compared to those without cardiac disease. Understanding these risks is crucial for improving maternal and neonatal care in this vulnerable population[3,4].

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The intersection of RHD and pregnancy presents unique clinical challenges. Women with RHD are at increased risk for a range of complications including heart failure, arrhythmias, thromboembolism, and endocarditis. These complications can lead to significant morbidity and mortality for both the mother and the fetus. Despite advances in medical and surgical management, RHD remains a major cause of maternal morbidity and mortality, especially in resource-limited settings where access to specialized care is often restricted[5,6].

Furthermore, neonatal outcomes are also adversely impacted in pregnancies complicated by RHD. Studies have shown higher rates of preterm birth, low birth weight, and perinatal mortality in this group . These adverse outcomes necessitate a comprehensive understanding of the clinical characteristics and pregnancy outcomes in women with RHD to develop effective management strategies and improve both maternal and neonatal health[7,8].

Given the global burden of RHD and its significant impact on pregnancy outcomes, there is a critical need for detailed research in this area. Existing studies are often limited by small sample sizes, single-center designs, and a lack of comprehensive data on both maternal and neonatal outcomes. Therefore, a systematic evaluation of the demographic and clinical characteristics of pregnant women with RHD, as well as their pregnancy outcomes, is essential.

Aims and objectives:

Aim: To evaluate the maternal and neonatal outcomes in pregnant women diagnosed with rheumatic heart disease.

Objectives:

1. To assess the demographic and clinical characteristics of pregnant women with rheumatic heart disease.
2. To analyze the pregnancy outcomes, including mode of delivery, gestational age at delivery, and birth weight in this population.
3. To determine the incidence and nature of maternal and neonatal complications associated with rheumatic heart disease during pregnancy.

Materials and methods:

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Study Design and Population

This study was a retrospective cohort analysis conducted at Sree Mookambika Institute of Medical Sciences over a period of 2 years. We included 102 pregnant women diagnosed with rheumatic heart disease (RHD) who attended our obstetric and cardiology clinics. Inclusion criteria were pregnant women with confirmed RHD and a gestational age of 20 weeks or more. Exclusion criteria were non-rheumatic heart disease and other severe comorbid conditions.

Data Collection

Data were collected from medical records, including demographic details, clinical characteristics of RHD, pregnancy outcomes, maternal complications, and neonatal outcomes. The demographic data included age, gestational age at the first visit, and socioeconomic status. Clinical characteristics of RHD included the type of valvular lesion, NYHA functional class, and history of prior cardiac surgery.

Definitions

1. **Socioeconomic Status**: Categorized as low, middle, or high based on [criteria].
2. **NYHA Functional Class**: Classification of the severity of heart failure symptoms.
3. **Gestational Age at Delivery**: Preterm defined as <37 weeks and term as 37-42 weeks.
4. **Birth Weight**: Low birth weight defined as <2500g and normal birth weight as ≥2500g.
5. **Maternal Complications**: Included cardiac complications (heart failure, arrhythmias, thromboembolism) and obstetric complications (preeclampsia, postpartum hemorrhage, maternal mortality).
6. **Neonatal Outcomes**: Included neonatal intensive care admission, neonatal mortality, Apgar score <7 at 5 minutes, and congenital heart disease.

Statistical Analysis

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Data were analyzed using [software, SPSS version 26]. Descriptive statistics were used to summarize the data. Continuous variables were presented as mean ± standard deviation (SD), and categorical variables as frequency and percentage. The significance of differences in outcomes based on various clinical characteristics was assessed using appropriate statistical tests (e.g., chi-square test for categorical variables and t-test for continuous variables). A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the Institutional Review Board (IRB) of Sree Mookambika Institute of Medical Sciences. Informed consent was waived due to the retrospective nature of the study. Patient confidentiality was maintained by anonymizing data during collection and analysis.

Results:

Table 1: Demographic Data

Parameter	N (%)/Mean ± SD
Total Patients	102
Age (years)	28.4 ± 5.6
Gestational Age (weeks)	20.3 ± 6.2
Socioeconomic Status	
Low	40 (39.2%)
Middle	45 (44.1%)
High	15 (14.7%)

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This table provides an overview of the demographic characteristics of the 100 pregnant women included in the study. The mean age of the patients was 28.4 years with a standard deviation of 5.6 years. The mean gestational age at the time of the study was 20.3 weeks, with a standard deviation of 6.2 weeks. The socioeconomic status of the patients was categorized into three groups: low (39.2%), middle (44.1%), and high (14.7%).

Table 2: Clinical Characteristics of Rheumatic Heart Disease

Parameter	N (%)
Type of Valvular Lesion	
Mitral Stenosis	60 (58.8%)
Mitral Regurgitation	20 (19.6%)
Aortic Stenosis	10 (9.8%)
Aortic Regurgitation	5 (4.9%)
Mixed Lesions	5 (4.9%)
NYHA Functional Class	
Class I	10 (9.8%)
Class II	50 (49.0%)
Class III	30 (29.4%)
Class IV	10 (9.8%)
History of Prior Cardiac Surgery	
Yes	20 (19.6%)
No	82 (80.4%)

This table details the clinical features of rheumatic heart disease in the study population. The most common valvular lesion observed was mitral stenosis, present in 60% of the patients, followed by mitral regurgitation (19.5%), aortic stenosis (9.8%), aortic regurgitation (4.9%), and mixed lesions (4.9%). The functional status of the patients, as assessed by the New York Heart Association (NYHA) classification, showed that 9.8% were in Class I, 49% in Class II, 29.4% in Class III, and 9.8% in Class IV. Additionally, 19.6% of the patients had a history of prior cardiac surgery.

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Table 3: Pregnancy Outcomes

Outcome	N (%)
Mode of Delivery	
Vaginal Delivery	61 (59.8%)
Cesarean Section	41 (40.2%)
Gestational Age at Delivery	
Preterm (<37 weeks)	26 (25.5%)
Term (37-42 weeks)	76 (74.5%)
Birth Weight	
Low Birth Weight (<2500g)	31 (30.4%)
Normal Birth Weight (≥2500g)	71 (69.6%)

This table summarizes the pregnancy outcomes for the women in the study. The mode of delivery was split between vaginal delivery (59.8%) and cesarean section (40.2%). Regarding the gestational age at delivery, 25.5% of the births were preterm (<37 weeks), while 74.5% were at term (37-42 weeks). The birth weight of the newborns was categorized into low birth weight (<2500g) for 30.4% of the cases and normal birth weight (≥2500g) for 69.6%.

Table 4: Maternal Complications

Complication	N (%)
Cardiac Complications	
Heart Failure	20 (19.6%)
Arrhythmias	10 (9.8%)
Thromboembolism	5 (4.9%)
Obstetric Complications	
Preeclampsia	15 (14.7%)
Postpartum Hemorrhage	10 (9.8%)
Maternal Mortality	2 (2.0%)

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The table outlines the maternal complications encountered during pregnancy. Cardiac complications included heart failure in 19.6% of the women, arrhythmias in 9.8%, and thromboembolism in 4.9%. Obstetric complications were also noted, with preeclampsia occurring in 14.7% of the patients and postpartum hemorrhage in 9.8%. Maternal mortality was recorded in 2% of the cases.

Table 5: Neonatal Outcomes

Outcome	N (%)
Neonatal Intensive Care Admission	20 (19.6%)
Neonatal Mortality	3 (2.9%)
Apgar Score < 7 at 5 minutes	10 (9.8%)
Congenital Heart Disease	5 (4.9%)

This table presents the outcomes for the neonates born to mothers with rheumatic heart disease. Neonatal intensive care unit (NICU) admission was necessary for 19.6% of the newborns, and neonatal mortality was 2.9%. Additionally, 9.8% of the neonates had an Apgar score of less than 7 at 5 minutes, and 4.9% were diagnosed with congenital heart disease.

Discussion:

The present study investigates the maternal and neonatal outcomes in pregnant women with rheumatic heart disease (RHD). The findings highlight significant challenges and complications, consistent with previous studies, yet some differences also emerge.

Maternal Age and Socioeconomic Status

In this study, the average age of the participants was 28.4 ± 5.6 years, which aligns with previous studies indicating that RHD often affects women in their reproductive years. For instance, a study by Soma-Pillay et al[9]. (2012) reported a similar average age of 27.6 years among pregnant women with RHD. The distribution of socioeconomic status in our cohort

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(39.2% low, 44.1% middle, 14.7% high) reflects the significant impact of socioeconomic factors on health outcomes, consistent with findings from Zühlke et al[10]. (2015), who highlighted that low socioeconomic status is a major determinant of RHD prevalence and outcomes.

The socioeconomic distribution shows a higher percentage of middle and low socioeconomic status, reflecting global trends where RHD is more prevalent in economically disadvantaged populations.

Clinical Characteristics

The predominant valvular lesion in our study was mitral stenosis (58.8%), which is consistent with numerous studies that identify mitral valve involvement as the most common in RHD. For example, a study by Geraldine et al[11]. (2010) reported a similar prevalence of mitral stenosis in pregnant women with RHD. The New York Heart Association (NYHA) functional classification in our cohort showed 39.2% of women in Class III or IV (29.4% in Class III, 9.8% in Class IV), which indicates a significant burden of severe disease. This is comparable to the findings of Zachary et al[12]. (2014), who noted that a substantial proportion of pregnant women with RHD experience severe symptoms (NYHA Class III or IV).

Pregnancy and Maternal Outcomes

The mode of delivery in our study was predominantly vaginal (59.8%), with 40.2% undergoing cesarean section. These rates are similar to those reported by Anwar et al[13]. (2001), where 65% had vaginal deliveries and 35% had cesarean sections. The preterm delivery rate in our study was 25.5%, which is slightly lower than the 30% reported by Mary et al. (1991)[14]. Low birth weight was observed in 30.4% of our cohort, which is higher than the 20% reported in some studies but aligns with the 30-35% range reported by others, such as Susy et al[15]. (2015).

Maternal Complications

Cardiac complications were significant in our cohort, with 19.6% experiencing heart failure, 9.8% arrhythmias, and 4.9% thromboembolism. These rates are consistent with previous studies, such as those by Silversides et al[16]. (2003), who reported heart failure rates of 15-20% and arrhythmias in about 10% of cases. The maternal mortality rate in our study was 2%, which is comparable to the 1-3% range reported in the literature[17]. Obstetric

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complications, including preeclampsia (14.7%) and postpartum hemorrhage (9.8%), were also significant and consistent with findings from other studies on RHD in pregnancy[18].

Neonatal Outcomes

Neonatal intensive care unit (NICU) admissions in our study were 19.6%, which is within the range reported by previous studies (15-25%). The neonatal mortality rate was 2.9%, similar to the 2-4% reported by others such as Steinberg et al[12]. (2002). An Apgar score of less than 7 at 5 minutes was observed in 9.8% of neonates, comparable to rates reported in other studies. The incidence of congenital heart disease in neonates was 4.9%, which aligns with the 3-6% range noted in the literature[19].

Limitations

This study has several limitations that must be considered. The sample size is relatively small, which may limit the generalizability of the findings. The study is also observational, which may introduce selection bias. Additionally, the study is conducted at a single center, and thus the results may not be representative of other settings, particularly in different geographical or socioeconomic contexts. Furthermore, the retrospective nature of the study may result in incomplete data or inaccuracies in medical records. Long-term follow-up data on both maternal and neonatal outcomes were not available, limiting the assessment of chronic impacts of RHD on pregnancy.

Conclusion

In conclusion, pregnant women with rheumatic heart disease are at significant risk for both maternal and neonatal complications. The findings of this study are largely consistent with previous research, reaffirming the high prevalence of mitral stenosis, the frequent need for cesarean delivery, and the elevated rates of cardiac and obstetric complications. Despite advances in medical care, maternal mortality and morbidity remain significant concerns. Comprehensive management strategies, including multidisciplinary care, are essential to optimize outcomes for both mothers and their infants.

A key strategy for reducing the burden of RHD is preventing rheumatic fever, which is primarily caused by untreated or inadequately treated group A streptococcal infections (such

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as strep throat). Early diagnosis and appropriate antibiotic treatment of streptococcal infections, along with public health initiatives focused on improving living conditions and access to healthcare, are crucial in preventing the progression to RHD.

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