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Frequency of Low Birthweight in Pregnant Women with Rheumatic Heart Disease

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ABSTRACT

Rheumatic heart disease (RHD), a complication of rheumatic fever, can cause serious valve damage and is a significant risk during pregnancy. It increases the chances of maternal and fetal complications, including low birth weight and maternal morbidity. **Objectives:** To determine the prevalence of low birth weight in full-term pregnancies among women diagnosed with rheumatic heart disease. **Methods:** A cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Services Hospital in Lahore. A sample of 96 pregnant women aged 18–40 years with rheumatic heart disease and full-term gestation (37–41 weeks) was selected by using non-probability consecutive sampling. Relevant laboratory and radiological investigations, including ECG and echocardiography, were done. The diagnosis of RHD was established, and women were followed until delivery, and fetal birthweight was measured and assessed for LBW. The data were recorded on specially designed Performa and analyzed using SPSS version 25.0. **Results:** The average age of the women was 26.78 ± 6.22 years. The mean gestational age, BMI and birth weight were 38.68 ± 1.20 weeks, 24.93 ± 2.06 kg/m and 2550.13 ± 403.1 g. The fetal male gender was dominant, as 59 (61.5%). The frequency of LBW was 57 (59.4%). The analysis revealed no significant differences in the frequency of low birth weight (LBW) with age, gestational age and BMI groups (p>0.05). **Conclusions:** Pregnant women with rheumatic heart disease were found to have a high rate of low birth weight among their infants. However, no significant links were established between low birth weight and factors such as maternal age, gestational age, or BMI.

INTRODUCTION

Rheumatic fever can lead to a serious heart condition known as rheumatic heart disease (RHD). Although it is believed to be autoimmune, the exact mechanism through which acute rheumatic fever progresses to RHD is not fully understood. The disease occurs when rheumatic fever damages the heart valves, leading to inflammation of the valves (valvulitis), heart muscle (myocarditis), or the heart's outer lining (pericarditis) [1]. Over time, chronic RHD often results in narrowing of the mitral valve, causing atrial enlargement, weakening of the ventricles, valve leakage, and irregular heart rhythms. Although the mitral valve is most commonly affected, the damage may also involve the aortic and tricuspid valves [2]. The World Health Organization (WHO) provides guidelines for the diagnosis and treatment of both rheumatic fever and RHD. While rheumatic fever has become rare among children in the United States, it remains prevalent in developing countries, where both rheumatic fever and RHD continue to pose significant public health challenges [3, 4]. The major diagnostic criteria for RHD include chorea (involuntary movements), carditis (inflammation of the heart), polyarthritis (joint inflammation), erythema marginatum (a distinctive rash), and subcutaneous nodules. Minor criteria may include polyarthralgia (joint pain), fever, a prolonged PR interval on ECG, and elevated levels of inflammatory markers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) [5]. In acute RHD, pancarditis may occur, indicated by new or changing heart murmurs or

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echocardiographic findings. Low birth weight (LBW), defined as a birth weight below 2,500 grams (5.5 pounds), is a key indicator of neonatal health, with significant implications for both immediate and long-term outcomes [6]. LBW is influenced by a range of maternal, fetal, and environmental factors and is a major concern among healthcare professionals, researchers, and policymakers globally. Maternal nutrition plays a vital role in determining birth weight, and deficiencies in nutrients such as folic acid, iron, and protein can contribute to LBW. Maternal health conditions like hypertension, diabetes, and substance abuse also negatively impact fetal growth, increasing the risk of LBW [7]. Maternal heart disease complicates approximately 1% to 4% of pregnancies worldwide and accounts for up to 15% of maternal deaths. In the United States, it is the leading cause of maternal mortality [8]. In Pakistan, about 1.2% of pregnant women have some form of heart disease, with RHD constituting 32% of these cases. The most commonly observed cardiac conditions during pregnancy include peripartum cardiomyopathy (PPCM), congenital heart disease (CHD), and RHD [9, 10]. Current trends suggest that maternal heart disease is likely to increase due to improved survival among women with congenital heart disease and delayed childbearing, which is associated with higher rates of comorbidities such as metabolic syndrome. As a result, cardiac disease may become an even more significant contributor to feto-maternal morbidity worldwide, affecting both developed and developing countries [11]. Fetal birth weight is one of the most commonly used indicators for evaluating pregnancy outcomes. LBW is linked to adverse outcomes, including increased risk of comorbid conditions and fetal mortality [12, 13]. Maternal cardiac disease, including RHD, is a known risk factor for LBW and other complications such as intrauterine death and poor Apgar scores [4]. The present study aims to determine the frequency of low birth weight in term pregnancies complicated by RHD. Despite being one of the most common cardiac conditions during pregnancy, RHD remains under-researched in Pakistan, particularly with its impact on birth weight. Furthermore, the reported frequency of LBW in RHD-affected pregnancies varies widely in international literature, ranging from 12.98% to 39.7% [4]. This study will help identify the frequency of LBW in women with RHD in our population, enabling better recognition of high-risk cases and contributing to improved feto-maternal outcomes through targeted antenatal care and management.

This study aims to assess the prevalence of low birth weight among full-term pregnancies in women diagnosed with rheumatic heart disease.

METHODS

The cross-sectional study was conducted in the Obstetrics and Gynaecology Department, Services Hospital, Lahore, over six months, from 1st January 2024 to 30th June 2024, after the approval of the ethics review committee (Ref no. IRB/2023/1257/SIMS). A sample size of 96 cases was determined based on a 53.7% frequency of low birth weight (LBW) among women with RHD. The confidence level was 95% and the margin of error was 10%. Rheumatic heart disease (RHD) was defined as a confirmed diagnosis during pregnancy based on clinical assessment and echocardiographic findings. Low birth weight (LBW) was defined as a neonatal weight of less than 2,500 grams (5.5 pounds), measured within one hour of birth using a calibrated digital scale. The study included pregnant women aged 18–40 years diagnosed with RHD and carrying full-term pregnancies (37–41 weeks), as determined by the last menstrual period (LMP). Exclusion criteria included pregnancies complicated by diabetes, presence of fetal anomalies on anomaly scan, and refusal to provide written informed consent. After obtaining approval from the hospital's ethics committee and relevant authorities, a total of 96 patients who fulfilled the inclusion and exclusion criteria were chosen from the antenatal clinic at Services Hospital in Lahore. All patients were informed about the study, and informed written consent was obtained. The demographic details were noted down, and clinical evaluation by detailed history and examination was done. Relevant laboratory and radiological investigations, including ECG and echocardiography, were done. The diagnosis of RHD was established as per operational definitions. The women were monitored until delivery, and the fetal birth weight was measured and evaluated for low birth weight (LBW) according to the operational definitions. All patients were managed following the hospital's standard care protocols, maintaining close collaboration with the cardiology department. The data was entered into a specially designed Performa. The data were analyzed using SPSS version 20.0. Quantitative variables such as age, gestational age, maternal BMI, and fetal birth weight were reported as mean ± standard deviation (SD). Qualitative variables, including low birth weight (LBW) and fetal gender, were expressed in terms of frequency and percentage. To control for effect modifiers such as age, gestational age, BMI, and neonatal gender, stratification was performed. The Chi-square test was applied after stratification, and a p-value of less than 0.05 was regarded as statistically significant.

RESULTS

The study summarizes the baseline characteristics of the 96 women included in the study. The mean maternal age was 26.78 ± 6.223 years, with a slightly higher proportion of

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participants under 27 years of age (56.3%). The average gestational age at delivery was 38.68 ± 1.201 weeks, and the mean BMI was 24.93 ± 2.063 kg/m^2. Male neonates were more common, accounting for 61.5% of the births. The mean birth weight was 2550.13 ± 403.1 grams, and low birth weight (LBW) was observed in 59.4% of the neonates (Table 1).

Table 1: Baseline Maternal and Neonatal Characteristics of the Study Population (n=96)

Variables	n (%) / Mean ± SD
Maternal Age (Years)	26.78 ± 6.223
Age < 27 Years	54 (56.3%)
Age ≥ 27 Years	42 (43.8%)
Gestational Age (Weeks)	38.68 ± 1.201
BMI (kg/m^2)	24.93 ± 2.063
Fetal (Male)	59 (61.5%)
Fetal (Female)	37 (38.5%)
Birth Weight (BW) (g)	2550.13 ± 403.1
Low Birth Weight (LBW)	57 (59.4%)

Association between various maternal and fetal characteristics and the occurrence of low birth weight in newborns. Among mothers younger than 27 years, 61.4% of LBW cases were observed, compared to 38.6% in mothers aged 27 years or older, though this difference was not statistically significant (p=0.21). Similarly, gestational age below 38 weeks was associated with 47.4% of LBW cases, while 52.6% were observed in those delivered >38 weeks, also showing no significant association (p=0.53). For maternal BMI, 54.4% of LBW cases were associated with BMI <25, versus 45.6% for BMI >35 (p=0.34). Male fetuses accounted for 57.9% of LBW cases compared to 42.1% in females, with no significant gender-based difference (p=0.38). Overall, none of the factors showed significant associations with low birth weight (Table 2).

Table 2: Comparison of Low Birth Weight by Maternal Age, Gestational Age, BMI, and Fetal Gender

Variables		Low Birth Weight		Total	p-Value
		Yes	No		
Age	<27 Years	35 (61.4%)	19 (48.70%)	54 (56.30%)	0.218
	≥27 Years	22 (38.60%)	20 (51.30%)	42 (43.80%)	
Gestational Age (Week)	<38	27 (47.40%)	16 (41.0%)	43 (44.080%)	0.53
	>38	30 (52.60%)	23 (59.0%)	53 (55.20%)	
BMI (kg/m^2)	<25	31 (54.40%)	25 (64.10%)	56 (58.30%)	0.34
	>25	26 (45.60%)	14 (35.30%)	40 (41.70%)	
Fetal Gender	Male	33 (57.90%)	26 (66.70%)	59 (61.50%)	0.38
	Female	24 (42.10%)	13 (33.30%)	37 (38.50%)	

DISCUSSION

Rheumatic heart disease (RHD) is a chronic, immune-mediated condition that arises following a group A beta-hemolytic streptococcal infection of the pharynx. It remains a significant public health concern, particularly in low- and middle-income countries, affecting over 15 million people globally [14, 15]. In the context of pregnancy, RHD poses unique challenges, contributing to elevated risks of maternal and fetal complications due to the increased hemodynamic demands of gestation. Our study explored the frequency of low birth weight (LBW) among full-term pregnancies complicated by RHD. The mean maternal age was 26.78 ± 6.22 years, with an average gestational age of 38.68 ± 1.20 weeks and a mean BMI of 24.93 ± 2.06 kg/m^2. Male fetuses accounted for 61.5% of births. The mean birth weight was 2550.13 ± 403.1 grams, and the overall frequency of LBW was 59.4%. This finding aligns closely with Khanna *et al.*, who reported a similar LBW rate of 53.7% in women with RHD [16]. Despite stratified analysis, no statistically significant associations were observed between LBW and maternal age, gestational age, BMI, or fetal gender. This suggests that these common maternal characteristics may not serve as reliable predictors of LBW in this population. The absence of significant associations may also reflect the complex interplay of other unmeasured factors, such as severity of valvular involvement, functional cardiac status (e.g., NYHA class), medication use, and access to antenatal care. Several large-scale studies have similarly highlighted the burden of fetal complications in women with RHD. A meta-analysis of 3928 pregnancies found high rates of preterm delivery (43%), LBW (39.7%), and intrauterine growth restriction (22.4%), reinforcing the importance of maternal cardiac health in determining neonatal outcomes [17]. Rivera *et al.*, also reported a substantial burden of LBW (33%) and NICU admissions in a cohort of women with cardiovascular disease, 37.2% of whom had RHD [18]. Likewise, Hu *et al.*, noted increased perinatal risk in pregnancies complicated by heart disease, including RHD, arrhythmias, and cardiomyopathies [19]. A study from a rural cohort reported a 1.72% prevalence of maternal heart disease with LBW in 30% of term neonates. The study emphasized the role of early diagnosis and optimal functional status in improving outcomes [20]. These findings, along with ours, underscore the importance of pre-pregnancy counselling, multidisciplinary antenatal care, and individualized delivery planning in women with RHD.

CONCLUSIONS

It was concluded that pregnant women with rheumatic heart disease were found to have a high rate of low birth weight among their infants. However, no significant links were established between low birth weight and factors such as maternal age, gestational age, or body mass index. These results indicate that additional factors beyond basic maternal characteristics may play a role in negative fetal outcomes in RHD pregnancies. This underscores the importance of specialized antenatal care and the need for further investigation.

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Authors Contribution

Conceptualization: RA
Methodology: RA, ZN, FF
Formal analysis: RA, ZN, FF
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All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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