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Impact of Pulmonary Hypertension on Maternal and Fetal Outcomes in Pregnancy

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A B S T R A C T

Background: Pulmonary hypertension (PH) means pulmonary artery pressure that is more than 25 mmHg at rest or 30 mmHg during physical activity. Obstetricians dispute extensively about PH-complicated pregnancies because of the significant risk of maternal and fetal disorders.

Objective: To explore the maternal and fetal outcomes in pregnancies with pulmonary hypertension.

Methodology: The current study was conducted at the Department of Gynecology, District Headquarter Hospital, Narowal from February 2020 to December 2020. Women who were pregnant and had either received a new or previous diagnosis of PH underwent follow-up and gave birth at our clinic were included in this study. Parameters pertaining to basic descriptive, medical, cardiac, and obstetrical data, along with maternofetal outcomes and issues, were collected. In close coordination with the pediatric, cardiology, hematology, chest disease, neonatology, critical care unit, and anesthesiology departments, standard protocols were adhered to. The last menstruation date and the results of the first trimester's ultrasound were used to determine the gestational age. The study was conducted after receiving approval from the institute's ethics committee.

Results: Out of 20 pregnancies, 6 pregnant women have been identified as being in Class I, 4 as being in Class II, 5 as being in Class III, and 5 as being in Class IV of the NYHA functional status classification in PH. The same table also included the clinical categories of the individuals. Pulmonary hypertension had been identified during pregnancy was 2 (10%) while 18 (90%) individuals had already been diagnosed. The most frequent maternal cardiac pathologies were mitral or aortic insufficiency cardiac disease (25%), atrial septal defect (20%), mitral stenosis (15%), ventricular septal defect 10%) and arrhythmia 10%).

Conclusion: It was concluded from the current study that Patients who are pregnant with PH require a well-thought-out, multidisciplinary approach to care that focuses on close observation before, during, and following delivery.

Keywords: Pulmonary Hypertension; Pregnancy; Maternal and Fetal Outcomes

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Introduction

Pulmonary hypertension (PH) is a complex and progressive condition characterized by elevated blood pressure in the pulmonary arteries, leading to increased resistance to blood flow through the lungs. It encompasses a spectrum of diseases classified into five major groups, ranging from idiopathic pulmonary arterial hypertension to pulmonary hypertension due to left heart disease. The etiology of PH varies, but common pathophysiological themes include endothelial dysfunction, vascular remodeling, and increased pulmonary vascular resistance. The standard description of pulmonary hypertension (PH) is a mean pulmonary artery pressure that is more than 25 mmHg at rest or 30 mmHg during physical activity. Its prognosis is not good, and the diagnosis might be either overlooked or delayed. PH carries a significant danger for the mother & the fetus and can be associated with a number of illnesses or problems.[1]

PH represents a significant risk to both maternal and fetal health during pregnancy, a period characterized by physiological changes that can exacerbate the condition. These changes include increased cardiac output, blood volume, and heart rate, which can lead to additional strain on the cardiovascular system. As a result, the presence of PH during pregnancy creates unique and often formidable challenges, impacting not only the well-being of the mother but also that of the developing fetus.[2]

Despite advances in medical care, PH remains a condition with a high maternal mortality rate during pregnancy. Studies have reported mortality rates ranging from 16% to 56%, depending on the severity of PH and the underlying cause. This elevated risk has led many healthcare providers to recommend against pregnancy for women with significant PH.[3-5]

PH-affected pregnant women require thorough monitoring and close teamwork from a multidisciplinary team. While there are specialized therapeutic approaches available for managing postpartum hypotension, most drugs are prohibited because of their teratogenicity.[6] Individuals may experience symptoms during pregnancy, and pulmonary arterial pressure may rise proportionately to cardiac output with a notable increase in the right ventricle's afterload. Angina and arrhythmia may manifest as clinical signs associated with right-ventricular failure, which can be attributed to the decline in cardiac function. In terms of the intensity of PH before to pregnancy, symptoms may be present while activity or even when at rest. Patients with arrhythmias or pulmonary thromboembolism are particularly vulnerable to sudden death.[7,8] There were also reports of high incidence of intrauterine growth retardations and fetal and maternal death.[9] Particularly in women having idiopathic PH, the majority of fatalities in these series happened during labor, delivery, or the postpartum period, with rates as high as 30% to 56%.[7-10] The fact that PH sufferers have low pregnancy tolerance, several experts advise against getting pregnant.[11] The current study was carried out to explore the Maternal and fetal outcomes in pregnancies with pulmonary hypertension.

The rationale for this study is to address the critical gaps in our understanding of maternal and fetal outcomes in pregnancies complicated by pulmonary hypertension. By analyzing clinical data, identifying risk factors, and assessing the effectiveness of current management strategies, the study aims to improve the safety of pregnancy for women with PH and enhance fetal outcomes. The results can guide clinical practice, inform patient counseling, and contribute to the development of more effective guidelines for managing high-risk pregnancies.

Objective

To explore the maternal and fetal outcomes in pregnancies with pulmonary hypertension.

Methodology

The current study was conducted at the Department of Gynecology, District Headquarter Hospital, Narowal from February 2020 to December 2020. A total of 20 pregnant women with PH were studied by taking their medical records. Women who were pregnant and had either received a new or previous diagnosis of PH underwent follow-up and gave birth at the study center were included in this study while those who were not followed or did not deliver in this unit were excluded. From the hospital records, parameters pertaining to basic descriptive, medical, cardiac, and obstetrical data, along with maternofetal outcomes and issues, were collected. In close coordination with the pediatric, cardiology, hematology, chest disease, neonatology, critical care unit, and anesthesiology departments, standard protocols were adhered to. The last menstruation date and the results of the first trimester's ultrasound were used to determine the gestational age. Ultrasonography data was employed when there was a difference between these modalities of more than five days. Every two weeks, Trans-abdominal Doppler ultrasound was performed for fetal follow-up. The majority of individuals were consulted by the cardiology clinic during their first trimester since they were diagnosed with PH before becoming pregnant. Cardiology & obstetrics clinics gave pregnancy termination to expectant mothers who couldn't handle their pregnancy.

Just one patient, aborted the two successive first-trimester pregnancies following a single term vaginal birth. When given a termination, several pregnant women choose to carry their babies to term. The cardiology department conducted standard cardiopulmonary

Table 1. Baseline characteristics of the study cases

Variables	N(%)
Age in years	27.09 ± 6.97
Gravidity	2
Parity	1
Diagnosis of pulmonary hypertension	
During pregnancy	2 (10%)
Before pregnancy	18 (9%)
Co-existent cardiac pathologies	
Mitral or Aortic insufficiency	5 (25%)
Atrial septal defect	4 (20%)
Mitral stenosis	3 (15%)
Ventricular septal defect	2 (10%)
Arrhythmia	2 (10%)
Mitral valve replacement	5 (25%)
Aortic valve replacement	3 (15%)
Mean pulmonary arterial systolic pressure	45.80 ± 16.05
New York Heart Association Functional Classification in pulmonary hypertension Classes	
I	6 (30%)
II	4 (20%)
III	4 (20%)
IV	5 (25%)
Average duration of pregnancy	22/7 ± 44/7
Clinical Classification of Pulmonary Hypertension (Venice 2003)	
Class 1.1. Idiopathic Pulmonary arterial hypertension	7 (35%)
Class 1.3.2. Congenital systemic-to-pulmonary shunts	3 (15%)
Class 2.1. Left-sided atrial or ventricular heart disease	2 (10%)

Class 2.2. Left-sided valvular heart disease	8 (40%)
Other morbidities	
Chronic kidney failure	1 (5%)
Deficiency in platelets	1 (5%)
Preeclampsia	1(5%)
Thyroiditis	1 (5%)
Nephritic syndrome	1 (5%)
Perinatal morbidity	
Preterm delivery	4 (20%)
IUGR	2 (10%)
Mode of delivery or other surgical procedures	
Caesarean section	14 (70%)
Normal vaginal delivery	6 (30%)
Dilatation and curettage	3 (15%)
Bilateral tubal ligation	5 (25%)
Postoperative complications	
Uterine hematoma	1 (5%)
Mean Apgar score	
1st min	9
5^{th} min	10

evaluations and echocardiograms each month. Because of cardiorespiratory limitations, patients were advised to be cautious with increased cardiac requirements and to refrain from manoeuvres that compress the inferior vena cava and reduce the venous return to the heart. In their third trimester, each woman visited the cardiac clinic and asked about the suitable the delivery route. Anesthesiologists consulted with the patients whose caesarean sections were scheduled before the procedure. Fetal heart rate monitoring was done twice for a week before to labor and constantly during labor, with a senior consulting obstetrician conducting each delivery. As arterial hypoxia might aggravate the hemodynamic effects of pregnancy by causing vasoconstriction, oxygen was given to maintain the pulmonary arterial oxygen level above 70 mmHg. Eleven individuals in this series got anticoagulation and antibiotics; eight patients had tocolytic therapy, which included ritodrine hydrochloride (fifty mcg/min Intravenous infusion) and magnesium sulphate (6 g/20 min loading dose accompanied by 2 g/hr. continuous therapy). For this reason, we began giving each person 6000 anti-Xa IU/0.6 ml enoxaparin sodium every day on the first day that fetal heartbeats were recorded. The medication was used throughout the pregnancy and ceased 12 hours before birth. Following delivery, all of our patients were sent to the cardiology clinic for the proper warfarin medication once the bleeding concerns had been removed.

Table 2. Features of pregnancy histories according to NYHA functional classification of pulmonary hypertension

Features	Class I (N=6)	Class II (N=4)	Class III (N=5)	Class IV(N=5)
Normal vaginal delivery	1	2	1	3
Caesarean section	5	0	5	3
Dilatation and curettage	0	1	0	2
Mean Gestational week at delivery	37	37	38	36
Mean Birth weight in gram	2770	2850	2850	2670
Maternal complication				
Postpartum uterine hematoma	1	0	Pulmonary edema n=1	Pulmonary edema n=1
Perinatal complication				
Intra uterine growth retardation	2	0	Preterm birth n=1 Preeclampsia n=1	Preterm birth n=3
Neonatal intensive care unit.	0	0	3	3

Results

Out of 20 pregnancies, 6 pregnant women have been identified as being in Class I, 4 as being in Class II, 5 as being in Class III, and 5 as being in Class IV of the NYHA functional status classification in PH (Table 1). The same table also included the clinical categories of the individuals. In our series, the average age was 27.09 ± 6.97 years. The median parity was 1, while the median gravidity was 2. Pulmonary hypertension had been identified during pregnancy was 2 (10%) while 18 (90%) individuals had already been diagnosed. The most frequent maternal cardiac pathologies were mitral or aortic insufficiency cardiac disease (25%), atrial septal defect (20%), mitral stenosis (15%), ventricular septal defect (10%) and arrhythmia (10%). Among study cases, 25% individuals had done mitral valve replacement and 15% had done aortic valve replacement preceding to their pregnancies. There were two pregnancies of twins and singleton babies made up the rest of the pregnancy. Additional morbidities found in the study group were hypothyroidism (5%), deficiency of thrombocytes (5%), thyroiditis (5%), preeclampsia (5%), nephritic syndrome (5%), and chronic renal failure (5%). Eight individuals had an ejection fraction of more than 60% according to echocardiography, and 7 of these individuals had a diagnosis of grade 2 tricuspid insufficiencies. There were 2 instances of intrauterine growth retardation and four preterm deliveries. There were 2 instances of intrauterine growth retardation and four preterm deliveries. There were 14 and 6 births that included a caesarean section (CS) and normal vaginal delivery (NVD), respectively. 5 women who wanted tubal ligation, 4 individuals in premature labor, and 4 individuals who had previously had CS were all terminated with CS. One patient experienced severe inguinal discomfort on the fifth postoperative day and had to have a re-laparotomy because of a uterine hematoma. In relations of complications, one woman suffering from excruciating inguinal pain on postoperative day 5, had done re-laparotomy because of uterine hematoma. A total of 22 newborns (15 female, 7 male) were delivered and 20 of these are still alive and healthy; while the remaining 2 infants were missing to follow-up (Table 2).

Discussion

The purpose of this research was to assess our maternofetal results in PH pregnant women. Our findings have demonstrated that pregnant women having pulmonary hypertension can expect an uncomplicated pregnancy and positive clinical outcomes. Therefore, we propose that for pregnant women with PH, appropriate care, constant monitoring, and multidisciplinary

teamwork result in excellent results for both the mother and the fetus. Pregnancies associated with PH occur at a rate of 1.1 per million women.[9] PH is linked to an increase in right ventricular subsequent load and increased pulmonary vascular resistance, which eventually cause right ventricular strain and right heart failure. Chronic PH results in hypertrophy in the right ventricular, which impairs contractility, increases oxygen consumption, and eventually leads to right heart failure.[12] The relevant literature reports a prevalence of maternal complications as well as mortality as high as 56% due to the adverse circulatory and hematological changes that occur in pregnant women with PH, despite improvements in survival rates brought about by new treatment regimens and the use of an effective multidisciplinary approach.[16] Furthermore, there are notable fetal concerns, including as growth retardation, preterm, and higher perinatal death.[5] Contraception or an early pregnancy termination are advised as the results for both the mother and the fetus are poor among pregnant women with PH. Despite the women's strong desire to carry on with their pregnancies, our abortion rate was still greater compared to that of a recent European study.[13]

Patients who demand to continue their pregnancy should be carefully screened at a tertiary care facility under the guidance of a multidisciplinary group that includes critical care components, as previously recommended.[14] Similar to our series, maternal-fetal morbidities and death may be lower than anticipated in women who are able to obtain this optimal follow-up standard potential. Our maternal and fetal results are encouraging since, at follow-up, there was no mother or newborn death, while Apgar scores were within acceptable ranges. Furthermore, there were no unfavorable outcomes or issues with the twin pregnancies having PH. Not even intrauterine growth retardation or premature birth resulted in additional morbidity for either the mother or the fetus. The insignificant tendency to higher mean pulmonary artery pressure (45.80±16.05 mmHg) in our PH patients may be largely responsible for these unexpectedly promising findings, and might also account for the decreased morbidity rate in our group. While both conventional birth and caesarean section are choices, the best delivery method for expectant mothers with PH is still up for dispute.[15,16] When forceps delivery is used to abbreviate the second phase of labor among pregnant women with PH, the mortality rate can be reduced.[19] Cardiac output can rise to 25% during active labor and up to 50% during maternal pushing attempts, which could worsen the already weakened heart function.[17] Compared to single pregnancies, maternal PH during twin pregnancies is an increasingly dangerous disorder.[18] We had two twin pregnancies in our series with PH that were categorized as Class IV. Both of them had difficult premature births. These women were closely monitored by obstetricians and cardiologists, but their pregnancies had to terminate in an early preterm delivery phase due to complications that occurred before the 32nd week of gestation. Compared to single pregnancies, these women's postpartum hospital stays were lengthier. The current research's primary limitations include its small sample size, retrospective methodology, and absence of selection criteria.

Conclusion

It was concluded from the current study that Patients who are pregnant with PH require a well-thought-out, multidisciplinary approach to care that focuses on close observation before, during, and following delivery. This strategy could help lower the number of unfavorable outcomes for mothers and fetuses.

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