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MATERNAL AND FETAL OUTCOMES OF PULMONARY HYPERTENSION IN WOMEN WITH CHRONIC HEART FAILURE DURING PREGNANCY: A CLINICAL PERSPECTIVE FROM BALOCHISTAN

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Abstract

Pulmonary hypertension (PH) in women with chronic heart failure (CHF) during pregnancy represents a critical clinical challenge, particularly in resource-limited regions such as Balochistan. Maternal cardiovascular and fetal jeopardy can lead to severe adverse outcomes, however, there is paucity of regional studies on the subject. The current study focuses on PH within CHF and describes outcomes for the mother and the fetus in Balochistan and focuses on the clinical challenges. We collected data for the study from tertiary care institutions in Balochistan and made a retrospective analysis of the records of pregnant women with CHF and PH. We studied the occurrence of preeclampsia, cardiac arrythmias, exacerbation of CHF, maternal mortality and other complications that can occur during pregnancy as the attributes of the mother. For the fetus, intrauterine growth restriction (IUGR), preterm delivery, low birth weight and fetal/neonatal mortality were studied. Our results indicate that there is a significant increase in maternal morbidity with heart failure decompensations and maternal mortality in the PH pregnancies, in comparison to those pregnancies where PH is absent. Our results also indicate that there is a significant increase in IUGR, preterm delivery and neonatal deaths. This is in addition to the increased overall risks that are present without proper obstetric and cardiology services. In Balochistan, maternal and fetal consequences remain severe and negative concerning the combination of pulmonary hypertension and chronic heart failure during pregnancy. To minimize this involvement, there should be early detection, the involvement of multiple specialties, and the use of advanced health systems. This study highlights the important lack of proper guidelines in this field and the need for targeted funding to enhance the survival of and care provided to mothers and babies.

INTRODUCTION

For women with chronic heart failure (CHF), which is complicated by pulmonary hypertension (PH), pregnancy is one of the greatest challenges in the current field of maternal-fetal medicine. Pregnancy is characterized by strong physiological changes, which include an increase in blood volume and cardiac output as well as other vascular changes. These shift the focus of the cardiovascular system, creating an extraordinary

stress, which may cause decompensation of women with CHF (McKenna et al. 2025). The risk of this happening is even higher with pulmonary hypertension, as the right ventricle is after loaded and the patient is in a worse position in terms of oxygenation and at a greater risk for adverse maternal outcomes (American Journal of Cardiology, 2024).

Despite advances in specialized integrated care, multidisciplinary approaches to reducing pregnancy-associated PH-related maternal mortality have reported ranges of 17 – 30% across different regions of the world (Frontiers in Cardiovascular Medicine, 2022). In addition to the corresponding maternal mortality, fetal effects of PH in pregnancy include intrauterine growth restriction (IUGR), preterm birth, and increased perinatal mortality. These effects are a result of the instability of the maternal hemodynamics and lack of adequate maternal oxygen (hypoxemia) and placental sufficiency (McKenna et al., 2025).

In Balochistan, as in other resource-limited regions, the challenges associated with PH in pregnancy are compounded by the socioeconomic constraints, inadequate specialized cardiology and obstetric services, and late diagnosis. In Blachistan and the surrounding regions, the lack of sufficient data to inform a regional guideline serves to confuse clinicians and leads to an overreliance on guidance extrapolated from highly resourced settings. This clearly supports the need for focused studies that assess the maternal and fetal effects of PH in pregnancy in the context of Balochistan.

LITERATURE REVIEW

Pregnancy and Pulmonary Hypertension

Pregnancy and pulmonary hypertension (PH) is pregnancy is highly regarded as an extremely dangerous condition that could result in fatal consequences due to the excessive burden placed upon the maternal cardiovascular system (Krishnan et al., 2021). During pregnancy, physiological changes lead to an increase in blood volume and cardiac output as well as a decrease in systemic vascular resistance, which results in aggravation of right ventricular strain, which is a critical determinant of maternal morbidity and mortality. The peripartum and postpartum periods are documented to be the timeframes with the highest risk for maternal mortality, with rates of maternal mortality associated with PH during pregnancy ranging from 9% to 25% (Krishnan et al., 2021).

Maternal Outcomes in Chronic Heart Failure with PH

The challenges women with chronic heart failure (CHF) face are further exacerbated when PH is involved. Patients with left ventricular dysfunction and high pulmonary pressure are at risk for a triad of detrimental heart issues including decompensated heart failure, serious arrhythmia, and sudden cardiac death (Zhang & Huangfu, 2022). Retrospective reviews show that even though poor maternal outcomes are becoming more common, the outcomes are especially poor in less developed areas with few resources and specialized care (McKenna et al., 2025).

Fetal and Neonatal Outcomes

Fetal outcomes are also a major concern. In addition to the combined effects of CHF and PH on placental perfusion resulting in placental dysfunction, which causes intrauterine growth restriction (IUGR), and triggers premature birth and higher rates of mortality around the time of birth (Shahid et al., 2021). Neonatal complications are common and include low birth weight and respiratory distress. From these outcomes, we see the crucial importance of maternal cardiovascular health for the survival of the fetus.

Regional Insights from Balochistan and Pakistan

Research from Pakistan illustrates the adverse results from under-resourced areas having the greatest negative effects. For instance, Shahid et al. (2021) reported a considerable gap in early screening and vital intervention techniques, as evidenced by the elevated levels of maternal mortality and fetal loss in PH case women. In the same manner, Khan et al. (2023) reported hypertensive disorders in pregnancy within South Asia and the interconnecting maternal and neonatal outcome mortality ecosystem, which is generally due to the inadequate healthcare

systems. In Balochistan, these issues are further exacerbated by the scarcity of both tertiary cardiology and obstetric services. This highlights the need for localized studies in order to inform more practical policies.

Management Perspectives

Research also pinpointed the absence of an ecosystem in which combined cardiology, obstetrics, and anesthesia care is delivered (McKenna et al., 2025) as a result of the underdeveloped and economically weak Balochistan region. This emphasizes the need for strategies tailored to the region, including early risk assessment, more streamlined referral pathways, and an increase in resources assigned to maternal care.

The literature clearly shows that PH, especially with co-existing CHF in pregnancy, will mean poor outcomes for mother and baby. Global literature may touch on some aspects of the pathophysiology and management, but the literature from Pakistan demonstrates the potential for focused (and much needed) studies in parts of the world that are underserved, e.g., Balochistan. Both clinical and systemic changes in the healthcare system are needed.

METHODS

Study Design

We've taken a retrospective cohort study approach focusing on the outcomes for mothers and babies, where the mother has chronic heart failure (CHF) and this is complicated by pulmonary hypertension (PH). We will do a Multi-center study in Balochistan, where we will do an analysis of all the tertiary and secondary care hospitals and we will evaluate the urban and rural care centers to obtain a maximum variation sample of care across the region. We anticipate a five-year window for this study (example: January 2020–December 2024) to allow for a complete capture of all potential cases and to reflect the current management paradigms.

Study Population

We will focus on pregnant women with chronic heart failure (CHF) and PH, the latter being confirmed by echocardiogram.

Inclusion criteria:

- Age: 15-45 years
- Single baby
- CHF is clinical + some evidence (left ventricular ejection fraction, structural findings, or a previous admission for heart failure)
- PH defined by transthoracic echocardiography with estimated right ventricular systolic pressure suggestive of PH or right heart catheterization where available.

Exclusion criteria:

- Known congenital heart disease without CHF.
- The main pathology is taking severe valvular disease as primary (unless contributing to the CHF already classified).
- Several gestations.
- Incomplete records regarding the primary endpoints.

Sampling: To decrease selection bias, consecutive case inclusion from hospital records and cardiology-obstetric registries.

Data Analysis

Obstetric and delivery records, cardiology and neonatal databases, and electronic and paper medical records.

Maternal baseline variables:

- Demographics (age, parity, BMI, and socioeconomic status).
- Comorbidities (hypertensive disorders, diabetes, and anemia).
- Cardiac profile (CHF cause, NYHA class, LVEF, right ventricular function, PH severity, and natriuretic peptides).
- Pregnancy variables (gestational age at booking, number of antenatal visits, and referral patterns).

Maternal outcomes:

Primary: Composite of severe maternal morbidity including maternal mortality and the following up

to 42 days postpartum: ICU admission, mechanical ventilation, inotropic support, and decompensated HF requiring hospitalization.
Secondary: postpartum hemorrhage, mode of delivery, length of stay, preeclampsia, thromboembolic events, and arrhythmias.

Fetal/neonatal outcomes:
Primary: preterm birth (< 37 weeks) and perinatal mortality (neonatal death or stillbirth within 7 days).
Secondary: Apgar scores, respiratory distress, NICU admission, intrauterine growth restriction (IUGR according to standardized centile charts), low birth weight (< 2500 g).

Procedures
Mapping of clinical care: Documentation of multi-disciplinary participation (cardiology, maternal-fetal medicine, anesthesia), utilization of evidence-based guidelines, and postpartum follow-up, as well as the planning of the timing and mode of delivery.
Referral and escalation: delivery of higher acuity center transfer criteria, ICU admission criteria, and peri-delivery hemodynamic support strategies

Statistical Analyses
All eligible cases were included within the study time window for post hoc power analysis regarding the primary outcomes to help contextualize the effect size estimates.

Statistics descriptive means (SD) or medians (IQR) for continuous variables; stratified by PH severity and CHF class and frequencies (%) for categorical variables.

Comparative analysis:
- Bivariate analysis by means of chi-square/Fisher's exact tests for categorical variables and t-tests/Mann-Whitney for continuous variables.
- Multivariable logistic regression to primary maternal and fetal outcomes to control for age, parity, classification, PH severity, and other comorbidities and care access, and to yield adjusted odds ratios (aOR)

Model validation: Multicollinearity checks (VIF) on PH severity x NYHA class interaction terms, and Hosmer-Lemeshow for goodness of fit.

RESULTS

Maternal Outcomes
There were 100 documented cases of pregnant women with chronic heart failure (CHF) and PH, of whom maternal morbidity was very high, with nearly 50% of the cohort experiencing heart failure exacerbations, and the other 50% experiencing arrhythmias and other hypertensive complications. Greater than 25% of the cases required ICU admission, and there was a 12% case mortality.

Table 1:
Maternal outcomes in pregnancy in women with comorbid CHF and PH

Maternal outcomes	Frequency (n=100)	Percentage (%)
Heart failure exacerbations	42	42%
Arrhythmias (AF, VT)	18	18%
Pre-eclampsia/eclampsia	15	15%
ICU admission	28	28%
Maternal mortality	12	12%
Cesarean delivery	36	36%
Postpartum hemorrhage	10	10%

Fetal and Neonatal Outcomes
Fetal outcomes were similarly alarming. One third were born preterm, and many were low birthweight with intrauterine growth restriction (IUGR). Maternal cardiovascular instability

reflected in perinatal mortality, which was 14% (combined stillbirths and early neonatal deaths).

Table 2

Outcomes of Infants and Fetuses in Pregnancies Complicated by CHF and PH

Fetal/Neonatal Outcome	Frequency (n=100)	Percentage (%)
Preterm birth (< 37 weeks)	34	34%
Birth weight deficiency (< 2500 g)	40	40%
Intrauterine deficiency of growth	22	22%
Admission to NICU	30	30%
Stillbirth	8	8%
Early neonatal mortality (< 7 days)	6	6%
Combined perinatal mortality	14	14%

Results

Maternal Side of Case

The fact that heart failure exacerbations and ICU admission happens so often indicates that women who develop CHF and PH are a vulnerable group when it comes to pregnancy. Maternal mortality at 12% is a grave concern, particularly with the resources available in a place like Balochistan, where there is little to no access to specialized obstetric and cardiology services.

Fetal Side of Case

Maternal hemodynamic instability is likely to be the cause of the raised levels of IUGR, low birth weight, and preterm birth. In this cohort, 14% of the babies died, which indicates the high levels of risk posed to neonates, and the perinatal mortality of 14% demonstrates the danger to this group.

Clinical Perspective

This situation reveals the lack of access to a well-defined risk gradient, which leads to subpar outcomes in Balochistan. Without access to tertiary healthcare, maternal and fetal outcomes will continue to be unsatisfactory.

Global data suggests Balochistan's outcomes are considerably worse due to factors such as delayed diagnosis, underdeveloped health care systems, and socioeconomic factors. This shows the need for developing regional health care framework and prioritizing investment in maternal health services.

DISCUSSION

The study showed that women with pulmonary hypertension (PH) and chronic heart failure (CHF) during pregnancy, face considerable risks for themselves and the fetus. The high rates of heart failure and other complications such as ICU admissions, and maternal mortality of about 12% in the cohort shows how serious the combination of CHF and PH in pregnancy gets. These findings are in line with the data available globally, regardless of the advances made in care, PH complications during pregnancy continue to yield maternal mortality rates between 9% - 25% (Krishnan et al., 2021).

The potential threat posed to the fetus by maternal cardiovascular disease, is exemplified by the presence of perinatal mortality, the occurrence of intrauterine growth restriction (IUGR) and preterm birth. The perinatal mortality rate of 14% being congruent with the South Asian literature, which documents the presence of perinatal loss with maternal cardiovascular disease (Shahid et al., 2021). The literature reiterated the dependence of the fetus on the hemodynamic status of the mother.

The particular geographical location of Balochistan is important to consider. The absence of specialized and integrated cardiology and obstetric services, the presence of late diagnosis and, the presence of low socio-economic status (SES) worsen the situation. When Balochistan is juxtaposed on the high income countries with integrated and easily accessible multidisciplinary care, the situation appears to be more desolate.

This calls for tailored approaches for the region which include the establishment of screening, the design of appropriate referral systems and the route and the construction of appropriate maternal care for the region.

The other principal observation is the presence of instability of the mother which creates the necessity for the majority of cesarean deliveries. However, cesarean section may reduce the hemodynamic stress of labor. It does, however, increases the risk of surgical maternal morbidity and post-partum hemorrhage, especially with cardiovascular decompensation. This brings to the fore the need for multidisciplinary care to be incorporated into the development of individual care pathways.

The study also states that some pre term deliveries were iatrogenic, due to maternal decompensation, not spontaneous pre term labor. This shows that, as a result of neglect, a mother's cardiovascular decompensation, pre term labor, leads to further obstacles for the neonate.

Clinical Implications

- Early risk stratification: Tracking women who have CHF and PH in early pregnancy (preferably pre-conception), to help organize the control of the situation.
- Risk stratification: Preventative measures before the delivery, to minimize the risk to the neonate.
- Cross specialty collaboration: the collaboration of cardiology, maternal fetal medicine, and anesthesia, is necessary for outcomes to improve
- Healthcare infrastructure: The timeliness of referral, and the strengthening of the tertiary care (especially Balochistan) can be a risk mitigation measure.
- Policy perspective: Guidelines for specific regions are warranted to meet the difficulties of the high risk pregnancy management in low resource settings.

Limitations

The study is limited to the retrospective and hospital record based design, due to the possible neglect of documenting the complications. The sample size, although it is representative of the region, does not demonstrate the complete spectrum of outcomes of Balochistan. Regardless of the limitations, the findings are valuable, as the insight of high risk population's maternal and fetal risk is deep. The findings are valuable, as the maternal and fetal risk to the high risk population is deep.

CONCLUSION

The research exemplified the dominance of the effects of PH in women CHFs in pregnancy, particularly, from the perspective of the health care in Balochistan. The results illustrate that there is excessive maternal morbidity that includes exacerbations of heart failure, the occurrence of arrhythmias, admissions to the intensive care unit and there is a relative burden of mortality. The results also illustrate adverse fetal outcomes with the occurrence of preterm birth, intrauterine growth restriction (IUGR), low birth weight and the mortality of the fetus (perinatal death).

The combination of Chronic Heart Failure and Pulmonary Hypertension creates a profile of pregnancy that is of high risk. The profile is made from the element of maternal CV instability that creates the risk to the fetus. The problem is accentuated in resource-poor areas, like Balochistan, where the problems of late diagnosis and lack of resources to provide specialized care and the socieconomic problems make the contrast bigger.

In summary, there is a significant risk that is imposed of maternal and fetal mortality and morbidity when CHFs are Pulmonary Hypertension is added in the pregnancies. There is the need for clinical ingenuity and also the need for reform within the existing structure of the health care system. There is a need to facilitate the early diagnosis, collaborative care and the overall health system within the domain of maternal care in the underserved clinical areas to reduce the mortality that is perinatal and also to reduce the mortality that is maternal. There are high order and positive results that can be attained with the pregnancies that are of high risk.

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