

Assessment of Clinical and Echocardiographic Findings of Pregnant Women with Dyspnea

Tabassum Muzaffar, Sadia Fatima*, Hajira Akbar**, Nighat Shafique**, Tahira Riaz, Rozina Shahid

Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Combined Military Hospital Terbel/National University of Medical Sciences (NUMS) Pakistan, **Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC/NIHD)/National University of Medical Sciences (NUMS), Rawalpindi, Pakistan

ABSTRACT

Objective: To measure the frequency of dyspnea in pregnant patients and to evaluate the clinical and echocardiographic findings of pregnant women had dyspnea.

Study Design: Analytical descriptive cross-sectional.

Place and duration of study: Gynae and Obstetric Department of Tertiary Care Facility from Feb 2022 to Apr 2022.

Methodology: It was an analytical cross-sectional study conducted during three months. Consecutive pregnant females through non-probability consecutive sampling were included in the study. Patients who had diagnosed history of cardiac disease, respiratory illness, anemic and had covid-19 infection history of 3 months were excluded. The calculated sample size was 323. The pregnant females were assessed for dyspnea (shortness of breath) during pregnancy. Those patients who had dyspnea were referred to cardiac facility for 2D-ECHO (Echocardiography) to determine the cause of dyspnea. Frequency & percentage and Mean±SD were calculated for qualitative and quantitative data respectively. Chi square test was applied to find association between categorical variables. Student t-test was applied for continuous data.

Results: A total of 323 pregnant females of age more than 18 years were included in the study. Out of 87(26.9%) pregnant females who had dyspnea during their pregnancy, 2(2.1%) females were from 1st trimester, 26(23.2%) of 2nd trimester and 59(50.8%) of 3rd trimester. ECHO showed that mean left ventricle end-diastolic diameter (LVEDd) was 46±8mm, LVEF 58.8±7%, sPAP 25.40±3.5mmHg and LVESd 29.33±8.8mm. As compared to the normal range sPAP, LVESd were in lower range, while LVEDd value was higher than the normal range (27.2 mm). Study population who had dyspnea and hypertension (HTN) were (n=13)15.4% ($p=1.000$) and (n=7) 7.7% were had Diabetes (DM) ($p=1.000$). Cardiac disease was found to be higher in females who had dyspnea i.e., (n=67) 76.9% ($p<0.0001$)

Conclusion: The left ventricular end-diastolic diameter (LVEDd), left ventricle end-systolic diameter (LVESd), and systolic pulmonary artery pressure (sPAP) of pregnant women with dyspnea were all outside of the normal range. So that the cardiac causes of dyspnea can be clinically identified, we advise ladies with dyspnea to visit a cardiologist and have an echocardiography test.

Keywords: Dyspnea, ECHO, Trimester.

How to Cite This Article: Muzaffar T, Fatima S, Akbar H, Shafique N, Riaz T, Shahid R. Assessment of Clinical and Echocardiographic Findings of Pregnant Women with Dyspnea. Pak Armed Forces Med J 2022; 72(Suppl-3): S659-662. DOI: <https://doi.org/10.51253/pafmj.v72iSUPPL-3.9578>

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INTRODUCTION

In most industrialised nations, pregnancies are planned, problems are few, and results are typically favourable for both mother and child. Negative effects are much more frequent in underdeveloped nations. The death of the woman or her foetus is the most serious negative pregnancy consequence. Maternal mortality has become incredibly rare in the developed world, with several nations reporting rates of 5-10 per 100,000 live births. The ratios are 100 times higher in the least developed countries.^{1,2} Dyspnea in pregnancy, also known as shortness of breath or difficult, labored breathing, is a common symptom that makes even simple daily activities difficult.³ Even if they have no history of cardiac or pulmonary disease, approximately half of all pregnant women will experience it at

some point during their pregnancy.³ These symptoms may be correlated to functional changes, the hematopoietic system, weight gain, and so on that occur during pregnancy.⁴⁻⁶ Difficulty in breathing during pregnancy could direct a de-compensation. The evaluation and managing of the critically ill obstetric patient with respiratory compromise presents obstetricians with a unique clinical challenge.^{3,7} This is chiefly due to maternal physiological adaptations, some pregnancy-specific conditions that require management of the critical care, and the existence of a fetus whose well-being is interconnected to the mother.⁷ Pregnancy brings contemplative deviations in the mother, causing substantial modifications to the normal physiology. During pregnancy, changes in anatomy and physiology affect the respiratory system.⁸⁻¹⁰

Dyspnea during pregnancy can be caused by anaemia, the weight of the growing uterus, increased

Correspondence: Dr Tabassum Muzaffar, Combined Military Hospital, Rawalpindi, Pakistan

pulmonary blood requirement and nasal congestion. Nearly 75% of all pregnant women develop exertional dyspnea during the first 30 weeks of pregnancy.¹¹⁻¹³ But, some women observe dyspnea without any underlying reason. The volume load caused by pregnancy causes changes in the cardiovascular system.

The purpose of our study was to determine the underlying cause of dyspnea. In such women, an approach of speedy delivery during the third trimester is often justified after weighing fetal outcome and maternal risk, permitting a differential diagnosis of dyspnea in normal pregnancy in contrast to pathological dyspnea. In this context, this study viewed at the different pathologies of pregnant women who had dyspnea in the third trimester.

We piloted clinical examinations of the patient population. Such information would be useful not only in the investigation of the cause of these pregnancy symptoms, but also in the management of patients with pre-existing cardiorespiratory disease who become pregnant. Keeping this in mind, the current study aims to determine the etiology of patients who present with dyspnea in an obstetric department and the focus on assessment of clinical and echocardiographic (ECHO) findings of pregnant females who complaint dyspnea. This, in turn, would be useful in development of institutional guidelines for managing such women with dyspnea, which could be beneficial for all pregnant females.

METHODOLOGY

This research was a analytical cross sectional carried out at gynecology & obstetric department of a tertiary care facility during three months i.e. Feb 2022 to Apr 2022.

Sample Size: The calculated sample size was 323 by taking 70% prevalence.¹⁵

Inclusion Criteria: Consecutive pregnant females irrespective of trimester were included in the study.

Exclusion Criteria: Patients who were diagnosed as cardiac patients, respiratory illness, anemic and had covid-19 infection history of 3 months were excluded.

We recruited pregnant females through non-probability consecutive sampling after ERC approval (Ltr# CMH-R/2022/225).

Patients who fulfilled the inclusion criteria were asked for the informed consent and then included in this study. The pregnant females were assessed for dyspnea (shortness of breath) during pregnancy by a predesigned, pre tested questionnaire. Those patients

who had dyspnea were referred to cardiac facility for 2D-ECHO (Echocardiography) to determine the cause of dyspnea.

Statistical analysis was accomplished using SPSS version-23. Descriptive stats was applied as frequency (percentage) and mean±SD, while statistics tests were calculated for qualitative and quantitative data respectively. Pearson’s chi-square test for categorical variables and t-test for continuous data was applied. *p*-value less than 0.05 was considered significant by taking 5% margin of error and 95% confidence interval.

RESULTS

A total of 323 pregnant females of age more than 18Years were included in the study. Out of which 95(29.4%) were in 1st trimester, 112(34.6%) from 2nd trimester and 116(35.9%) were from 3rd trimester. A total of 87(26.9%) pregnant females who had dyspnea during their pregnancy out of which, 2(2.1%) females were from 1st trimester, 26(23.2%) of 2nd trimester and 59(50.8%) of 3rd trimester as shown in Figure-1.

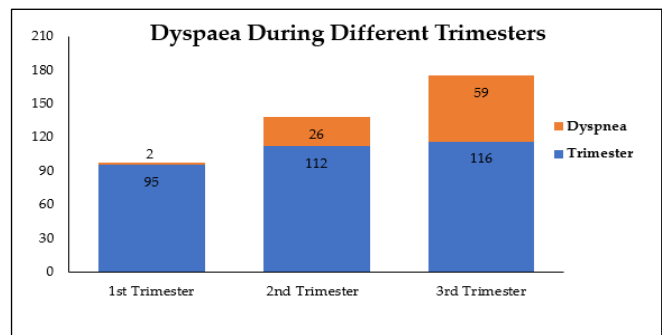


Figure-1: Pregnant Females having dyspnea during 1st to 3rd trimester

The females who had difficulty in breathing underwent echocardiography assessment. ECHO showed that mean LVEDd was 46±8mm, LVEF 58.8±7%, sPAP 25.40±3.5 mmHg and LVESd 29.33±8.8mm. As compared to the normal range sPAP, LVESd were in lower range, while LVEDd value was higher than the normal range (27.2mm).

Independent sample t-test was used to find the association between dyspnea and clinical parameters like AST (*p*=0.469), Hemoglobin (*p*=0.272), glucose fasting (*p*=0.767) and ALT (*p*=0.253) and it was not significantly associated. The detailed laboratory profile and ECHO findings were shown in Table-I.

Chi-square test was applied to compare the relationship of dyspnea with three trimesters of pregnancy. The association was found to be statistically significant (*p*<0.0001) as shown Table-II.

Table-I: Clinical Parameters of Pregnant Patients

Lab Findings	Mean ± SD	Normal Range	p-value
Hb (g/dl)	10.93±1.2	12-14	0.272
Glucose (mg/dl)	90.20±40.1	60-100	0.767
ALT (u/l)	23.71±9.2	<41	0.53
AST (u/l)	24.50±7.5	8-33	0.469
ECHO Findings			
LVEF (%)	58.8±7	54-74	
sPAP (mmHg)	25.40±3.5	36-51	
LVESd (mm)	29.33±8.8	35-56	
LVEDd (mm)	46±8	27.2	

Table-II: Comparison of Dyspnea with Trimester

	Trimester			Total	p-value
	1st (1-12wk)	2nd (13-26wk)	3rd (>27wk)		
Dyspnea	2	26	59	87	<0.001
Total	95	112	116	323	

Study population who had dyspnea and hypertension (HTN) were 13(15.4%) ($p=1.000$) and 7(7.7%) were had Diabetes (DM) ($p=1.000$). Cardiac disease was found to be higher in females who had dyspnea i.e. 67(76.9%) ($p<0.0001$) as depicted in Figure-2.

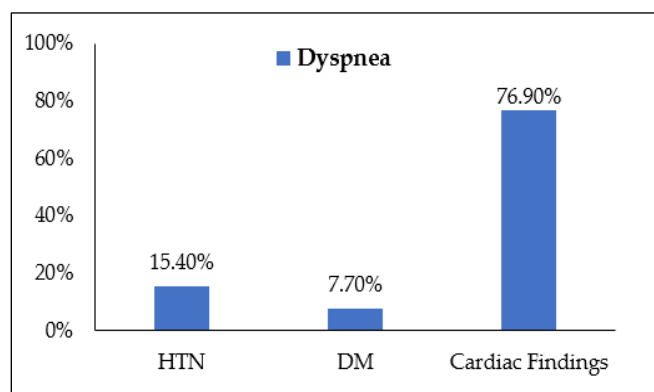


Figure-2: Co-morbidities of Pregnant Females Along with Dyspnea (n=87)

DISCUSSION

Dyspnea is common in healthy pregnancy. Approximately half of women without a history of cardiorespiratory disease reported dyspnea before the 19th week of pregnancy, and 76% by the 31st week.^{11-14,16} However, our study found similar results because many women complained of dyspnea. Number of pregnant women was 95(29.4%) in 1st trimester, 112(34.6%) from 2nd trimester and 116(35.9%) from 3rd trimester. A total of 87(26.9%) pregnant females who had dyspnea during their pregnancy out of which, 2(2.1%) females were from 1st trimester, 26(23.2%) of 2nd trimester and 59(50.8%) of 3rd trimester. In our

study comparison between number of trimester and dyspnea was also made $p<0.0001$ (Table-II)

In another study group's average age of pregnant women with dyspnea was 27.97±6.57 (between the ages of 18 and 41), while the control group's average age was 30.06±6.57 (19 to 42). ($p=0.211$).¹⁷ This finding is similar in our study also because age (29.9±4.5) is statically insignificant ($p=0.469$), as shown in Table-I.

Pregnancy-related physiological changes that affect the cardiovascular system might lead to issues like dyspnea. According to Somani *et al.* peripheral vascular resistance reduced as the trimesters went on, while cardiac output, ejection fraction, and stroke volume all increased.¹⁴ Between 30% and 50% more blood is produced during pregnancy. It's also possible that there will be some hemodynamic changes, such as a rise in cardiac output and pulse rate and a fall in systemic vascular resistance and blood pressure. As a result, pregnant women who have dyspnea should have their haemoglobin levels checked. In terms of haemoglobin levels, our study found no statistically significant difference between the study and control groups ($p=0.508$).^{16,17} Our study population showed another similarity regarding hemoglobin (10.93±1.2) and it was found statistically insignificant ($p=0.272$).

In the continuation of the same study, there was no statistically significant difference between the groups when other biochemical factors like glucose, ALT, AST, and total protein concentration were evaluated (p -values for these variables were $p=0.229$, $p=0.160$, $p=0.088$, and $p=0.279$, respectively).¹⁷ in our study population, results were ALT 23.71±9.2, glucose level 90.20±40.1, AST 24.50±7.5. Moreover statistically insignificant association was observed with diabetes (DM) ($p=1.000$).

Another Indian study showed echocardiography changes revealed that the left ventricle end-diastolic diameter (LVEDd) in the study group was 47.3±83.68 (41-56)mm and 43.70±8.84 (24-57)mm in the control group ($p=0.041$). However, while the left ventricle end-systolic diameter (LVESd) in the study group was 30.8±63.90 (24-40)mm, it was 34.4±56.56 (25-49)mm in the control group ($p=0.013$). When the left ventricular ejection fraction (LVEF percent) was determined, it was found to be 64.38±64.36 (60-68) in the study group and 64.3±62.78 (60-69) in the control group ($p=0.982$).¹⁷ The left ventricular end-diastolic diameter (LVEDd), left ventricular end-systolic diameter (LVESd), left ventricular ejection fraction (LVEF%), and systolic pulmonary artery pressure (sPAP), determined from

tricuspid insufficiency, were also assessed in our study using echocardiography. The mean end-diastolic diameter of the left ventricle was determined by our ECHO results (LVEDd) was 46 ± 8.0 mm, LVEF $58.8 \pm 7.0\%$, sPAP 25.40 ± 3.5 mmHg and LVESd 29.33 ± 8.8 mm. As compared to the normal range sPAP, LVESd were in lower range, while LVEDd value was higher than the normal range (27.2 m^2). Moreover, Cardiac findings were found to be higher in females who had dyspnea which is quite alarming. i.e., 76.9% ($p < 0.0001$) as depicted in figure-2.

Few other studies found that the cut-off for SBP was >140 and 160 mmHg,¹⁸ while the cut-off for DBP was >90 mmHg,¹⁹ and MAP was >105 mmHg.²⁰ Although these studies found that none of them discovered a therapeutically relevant blood pressure measurement as a predictive diagnostic for poor maternal outcomes, despite strong connections (p -values 0.05) between blood pressure and unfavourable outcome. In our study, this finding is opposite as hypertension (HTN) for both systolic and diastolic has shown statistically insignificant value with prevalence of 15.4% ($p=1.000$) (As shown in Figure-2).

LIMITATIONS OF STUDY

There are several restrictions on this study. It was a single-center study, and more extensive multi-center investigations with larger participant populations are required. Similar to the last study, this one's strength comes from the fact that its data came from a tertiary hospital with a robust database and network.

CONCLUSION

The left ventricular end-diastolic diameter (LVEDd), left ventricle end-systolic diameter (LVESd), and systolic pulmonary artery pressure (sPAP) of pregnant women with dyspnea were all outside of the normal range. So that the cardiac causes of dyspnea can be clinically identified, we advise ladies experiencing dyspnea to visit a cardiologist and get an echocardiography.

ACKNOWLEDGEMENT

I am grateful to my friends and family who guided me throughout this project. I also want to share my gratitude towards Comdt/Executive Director AFIC for his support and I would like to thank R&D Department for guiding me and offered deep insight into the study.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

TM: Manuscript writing, idea, intellectual contribution

SF: Editing, article review, proof reading

HA: Statistical Analysis, interpretation and proof reading

NS: Statistical Analysis, proof reading

TR: Data management, data collection & manuscript writing

RS: Data collection, data management and editing

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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