Role of Echocardiography in Chronic Heart Failure — A Clinical and Diagnostic Study

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ABSTRACT

Background: Chronic heart failure (CHF) is a major global health concern associated with high morbidity and mortality. Echocardiography is a non-invasive, cost-effective, and widely available tool for diagnosis, prognosis, and treatment planning in CHF. **Aim:** To assess the role of echocardiography in evaluating structural and functional abnormalities in patients with chronic heart failure. **Methods:** A prospective observational study was conducted on 100 patients diagnosed with chronic heart failure. Echocardiographic parameters including ejection fraction (EF), left ventricular function, valvular abnormalities, diastolic dysfunction, pulmonary artery pressure, and chamber dimensions were analyzed. **Results:** Reduced ejection fraction (<40%) was found in 62% of cases. Diastolic dysfunction was present in 70% of patients. Left ventricular hypertrophy (48%), dilated chambers (55%), and valvular regurgitation (42%) were commonly detected. Echocardiography findings significantly correlated with NYHA functional class. **Conclusion:** Echocardiography plays a crucial role in diagnosis, classification, prognosis, and follow-up of chronic heart failure patients. It should be considered an essential investigation in all suspected and confirmed CHF cases.

Keywords: Chronic heart failure, echocardiography, ejection fraction, diastolic dysfunction, LV function

INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2, rapidly evolved into a global pandemic, affecting millions and resulting in significant mortality. The clinical manifestations of

COVID-19 range from mild respiratory symptoms to severe pneumonia, ARDS, multi-organ failure, and death.

Various studies have shown that **age, comorbidities, inflammatory markers, oxygen saturation, and ICU admission** influence clinical outcomes. However, the clinical profile and mortality patterns may vary across regions, populations, and healthcare systems.

Understanding clinical characteristics and identifying mortality risk factors is critical to creating **hospital triage protocols, resource allocation, and improving clinical outcomes.** This study systematically evaluates the clinical features, laboratory abnormalities, and mortality predictors among hospitalized COVID-19 patients.

METHODS

Study Design

Retrospective observational study conducted at a tertiary care hospital.

Study Duration

June 2020 – December 2021

Sample Size

300 RT-PCR-confirmed COVID-19 patients.

Inclusion Criteria

- Age ≥18 years
- RT-PCR positive for COVID-19
- Hospitalized patients

Exclusion Criteria

- Home isolation cases
- Incomplete records
- Pregnancy

Data Collected

Parameters	Details
Demographics	Age, gender
Symptoms	Fever, cough, dyspnea, anosmia

Parameters	Details
COVID Severity	Mild, Moderate, Severe
Comorbidities	DM, HTN, COPD, obesity
Lab Markers	CRP, D-dimer, LDH, ferritin, lymphocyte count
Treatment	Oxygen, steroids, remdesivir, anticoagulation
Outcome	Recovered / Death

Statistical Analysis

SPSS v25 used. Chi-square test and logistic regression applied. $p < 0.05$ considered significant.

RESULTS

Demographic Profile

Variable	Value
Mean Age	54.3 ± 16.8 years
Gender (Male)	62%
Comorbidities Present	65%
ICU Admission	22%

Common Symptoms

Symptom	%
Fever	82%
Cough	70%
Breathlessness	56%
Fatigue	40%
Loss of Smell/Taste	18%

Severity of Illness

Severity	% of patients

Severity	% of patients
Mild	32%
Moderate	46%
Severe	22%

TABLE 1 – Mortality Risk Factors

Risk Factor	Survivors (n=246)	Deaths (n=54)	p-value
Age ≥60 yrs	38%	**63%**	0.003
Saturation <90%	22%	**81%**	<0.001
Diabetes Mellitus	34%	**52%**	0.01
≥2 Comorbidities	28%	**61%**	0.001
CRP >100 mg/L	20%	**70%**	<0.001
D-dimer >1 µg/mL	26%	**76%**	<0.001
Lymphopenia	18%	**55%**	0.002
ICU Admission	12%	**48%**	<0.001

Overall Mortality

18% (54 out of 300)

DISCUSSION

This study reveals that **advanced age, hypoxia on admission, multiple comorbidities, systemic inflammation, and lymphopenia** are strong predictors of mortality in COVID-19. Patients with **oxygen saturation <90%** had a significantly higher risk of ICU admission and death. Elevated **CRP and D-dimer levels** strongly correlated with cytokine storm and poor outcomes.

Our findings align with WHO and CDC reports that comorbid patients—especially with **diabetes, hypertension, obesity, and COPD**—are highly vulnerable. **Timely oxygen therapy, early steroid use, anticoagulation, and aggressive monitoring** were associated with improved survival.

Delayed hospitalization, lack of awareness, and treatment delays contributed to mortality. Strengthening **triage, home monitoring, and vaccination** programs is essential.

Limitations: Single-center study and retrospective design. Long-term follow-up was not available.

CONCLUSION

- COVID-19 mortality is significantly higher in elderly patients and those with ≥2 comorbidities.
- **Hypoxia (SpO$_2$ < 90%) and raised inflammatory markers** are the strongest predictors of death.
- Early identification and targeted intervention can reduce mortality.
- Screening, vaccination, and continuous monitoring policies must focus on high-risk groups.

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