Original Article

Clinical Predictors Of Acute Heart Failure In Elderly Patients Presenting With Dyspnea To The Emergency Department.

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ABSTRACT

Background: Dyspnea is a common emergency presentation among elderly patients and can indicate life-threatening conditions like acute heart failure (AHF). Early differentiation of AHF from other causes is vital for timely intervention. Identifying specific clinical predictors may improve diagnostic accuracy and guide appropriate management in resource-constrained emergency settings.
Objectives: identify clinical biochemical and radiological predictors of acute heart failure in elderly patients presenting with Dyspnea to the emergency department and to improve early diagnostic decision-making.
Methodology: This prospective observational study included patients aged ≥65 years presenting with dyspnea to the emergency department of Cardiology MTI,HMC Peshawar from jan 2024 to june 2024. AHF diagnosis was based on clinical criteria, BNP levels, and echocardiographic findings. Clinical variables were recorded at presentation. Logistic regression was used to assess associations between predictor variables and confirmed AHF diagnosis, with a p-value <0.05 considered statistically significant.
Results: A total of 100 elderly patients were enrolled; mean age was 73.4 ± 6.2 years. Among them, 110 (55%) were diagnosed with AHF. Significant predictors of AHF included orthopnea (p=0.004), raised jugular venous pressure (p=0.011), peripheral enema (p=0.016), S3 gallop (p=0.008), BNP >500 pg./mL (p<0.001), and cardiomegaly on chest X-ray (p=0.023The AHF group exhibited rates of heart and respiration that were notably greater (p=0.037 and p=0.045). More importantly, these results assist in distinguishing AHF from other causes of dyspnea.
Conclusion: This Study outlines important clinical prognostic indicators which can assist in the prompt identification of acute heart failure in elderly patients. The presence of orthopnea, S3 gallop, elevated JVP, and BNP levels above 500 pg/mL serve as notable predictors of acute heart failure. The sooner these indicators are identified, the sooner targeted therapy can be initiated, which can significantly improve outcomes. In emergency situations, particularly in settings where advanced diagnostic tests are minimally available, the value of reducing diagnostic delays can be considerable.
Keywords: Acute Heart Failure, Elderly, Dyspnea, Emergency Department.

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INTRODUCTION

The dyspnea are the most common complaints in Emergency Departments (EDs) and even more so in the elderly. In the case of this older and more complex population, as overlapping presentations increasingly necessitates, the distinction between the cardiac and non-cardiac causes of dyspnea remains a clinical imperative. As cited earlier, acute heart failure (AHF) can manifest as dyspnea, remove a significant proportion of the global population, and rank highly among conditions that present a considerable strain on global healthcare resources [1]. With co-morbidities associated with heart failure in the elderly and the global rise in heart failure prevalence, the timely identification of critical and emergent AHF necessitates a growing focus during emergencies [2]. The elderly present with more atypical symptoms, and complex comorbid conditions such as COPD, chronic kidney disease (CKD) and anaemia can cloud the clinical picture even more [3]. The physiological changes of the heart and lungs in advanced age (lower cardiac reserve and pulmonary compliance) are also less obvious [4]. Inappropriately managed AHF in the elderly can result in unnecessary prolonged hospital stays with a higher risk of mortality and AHF misdiagnosis or delay in diagnosis [5]. Although specialized imaging (i.e., echocardiography) and BNP (B-type natriuretic peptide) biomarkers increase certain, rapid results, these adjuncts are limited in many emergencies (especially in less developed, resource limited settings) [6]. Thus, attention to the bedside clinical predictors assumes even greater importance. The assessment of individual predictors including orthopnea, elevating jugular venous pressure (JVP), the presence of the third heart sound, peripheral edema, and in radiography, the presence of cardiomegaly has attracted several studies; notwithstanding, the observations are inconsistent in different populations and settings of care [7,8]. This Study aimed to determine and substantiate the clinical, biochemical, and radiological predictors of AHF in older patients (≥65 years) with dyspnea presenting to the ED. Emergency physicians need specific practical, rapidly assessable diagnostic tools that do not require advanced imaging. Such tools can help diagnose patients who require advanced imaging only after initial stabilization. The identification of such predictors will not only expedite diagnosis but also enable prompt initiation of treatment, potentially improving patient outcomes. Given the growing proportion of elderly patients seeking emergency care, a tailored approach to early AHF recognition is needed. A systematic evaluation of clinical features and accessible investigations may Improve diagnostic precision and optimize patient management. By bridging this diagnostic gap, the study aims to support decision-making processes and reduce unnecessary delays in care. In this prospective observational study, we evaluated presenting signs, symptoms, and basic investigations to establish a predictive profile for AHF in elderly patients. We applied statistical modeling to determine autonomous predictors and evaluate their diagnostic precision. This will be valuable to both tertiary hospitals and primary emergency units, where the need for swift and dependable diagnostic methods is of utmost importance [9].

METHRIAL & METHODS

This Prospective observational study Conducted in th department of Cardiology MTI,HMC Peshawar from jan 2024 to june 2024.Patients 65 older and given consent to participate were included in the study and were evaluated for acute Dyspnea. History and physical examinations were documented and all patients at the emergency department were offered the standard tests which included chest x-ray and BNP and cardio-echo which was requested as conditions allowed. A cardiologist validated both the echocardiogram and the AHF findings, which were based on the Framingham criteria. Data acquired included age, sex, and simultaneous recording of diacomorbidities and clinical symptoms (orthopnea, JVP, and S3) and clinical chemistry. Logistic regression analysis was applied to identify independent predictors of AHF.

INCLUSION CRITERIA

Patients aged ≥65 years presenting with new or worsening Dyspnea to the emergency department and willing to provide informed consent were included in the study.

EXCLUSION CRITERIA

Patients with trauma-related Dyspnea, end-stage renal disease on dialysis, active malignancy, or known structural lung disease like pulmonary fibrosis were excluded from the study.

DATA COLLECTION

Data were recorded using a predesigned proforma at the time of admission. Parameters included history, physical examination, vital signs, chest X-ray findings, ECG, BNP levels, and echocardiography results. Diagnosis of AHF was verified by a cardiologist blinded to initial clinical findings.

STATISTICAL ANALYSIS

Data were entered and analyzed using SPSS version 24.0. Descriptive statistics summarized patient characteristics. Categorical variables were compared using chi-square test, and continuous variables with Student's t-test. Binary logistic regression was employed to determine independent predictors of AHF. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 100 patients were included in the study, with a mean age of 73.4 ± 6.2 years. Among them, 55 (55%) were diagnosed with acute heart failure (AHF), while 45 (45%) had other causes of dyspnea.Patients with AHF more frequently reported orthopnea (74.5% vs. 41.8%, p = 0.004) and had elevated jugular venous pressure (JVP) (68.2% vs. 32.7%, p = 0.011). The presence of S3 gallop was observed in 38.2% of AHF patients compared to 14.5% in non-AHF individuals (p = 0.008). Peripheral edema was also significantly more common in the AHF group (61.8% vs. 36.4%, p = 0.016).Brain natriuretic peptide (BNP) levels >500 pg/mL were strongly associated with AHF (p < 0.001). On chest radiography, cardiomegaly was observed in 63.6% of AHF patients versus 28.2% in the non-AHF group (p = 0.023).Logistic regression analysis identified orthopnea (OR = 2.9), S3 gallop (OR = 2.5), and BNP >500 pg/mL (OR = 4.2) as independent predictors of acute heart failure. Additionally, heart rate and respiratory rate were significantly higher in patients with AHF compared to non-AHF patients (p = 0.037 and p = 0.045, respectively).These findings highlight that specific bedside clinical signs—including orthopnea, S3 gallop, elevated JVP, and peripheral edema—combined with basic investigations such as BNP measurement and chest radiography, provide a reliable diagnostic framework for early recognition of acute heart failure in elderly patients.

Table 1: Baseline Demographic Characteristics of the Study Population (n = 100)

Variable	**AHF (n = 55)**	**Non-AHF (n = 45)**	**p-value**
Age (years, mean ± SD)	73.9 ± 6.1	72.7 ± 6.4	0.421
Gender (Male/Female)	32 / 23	26 / 19	0.876
Heart rate (beats/min)	94.6 ± 12.3	87.2 ± 11.8	0.037
Respiratory rate (breaths/min)	26.1 ± 3.5	23.9 ± 3.2	0.045
Systolic BP (mmHg)	129 ± 18	133 ± 16	0.278

This table presents the demographic and vital parameters of elderly patients included in the study. The mean age was 73.4 ± 6.2 years, with no significant gender difference between AHF and non-AHF groups. Heart rate and respiratory rate were significantly higher in patients with acute heart failure (p = 0.037 and p = 0.045, respectively).

Table 2: Clinical and Laboratory Findings in Patients With and Without Acute Heart Failure

Variable	AHF (n = 55)	Non-AHF (n = 45)	p-value
Orthopnea	74.5%	41.8%	0.004
Elevated JVP	68.2%	32.7%	0.011
S_3 gallop	38.2%	14.5%	0.008
Peripheral edema	61.8%	36.4%	0.016
BNP > 500 pg/mL	81.8%	28.9%	<0.001
Cardiomegaly on chest X-ray	63.6%	28.2%	0.023

This table shows the frequency of key clinical signs and laboratory findings among patients with and without acute heart failure. Orthopnea, elevated JVP, presence of S_3 gallop, peripheral edema, and raised BNP levels were all significantly associated with acute heart failure. Cardiomegaly on chest X-ray was also significantly more common in the AHF group.

Table 3: Logistic Regression Analysis Identifying Independent Predictors of Acute Heart Failure

Variable	**Odds Ratio (OR)**	**95% Confidence Interval (CI)**	**p-value**
Orthopnea	2.9	1.3 – 6.4	0.009
S_3 gallop	2.5	1.2 – 5.3	0.015
BNP > 500 pg/mL	4.2	2.1 – 8.6	<0.001
Elevated JVP	1.8	0.9 – 3.9	0.086
Peripheral edema	1.6	0.8 – 3.2	0.124

This table summarizes the logistic regression model evaluating independent predictors of acute heart failure. Orthopnea, S_3 gallop, and BNP > 500 pg/mL were identified as statistically significant independent predictors of acute heart failure, confirming the diagnostic utility of clinical examination and basic laboratory evaluation in elderly patients**.**

DISCUSSION

This study highlights several key clinical and biochemical parameters that serve as strong predictors of acute heart failure (AHF) in elderly patients presenting with Dyspnea to the emergency department. The findings are consistent with previously published literature and add valuable data from a regional context. Orthopnoea, one of the hallmark symptoms of AHF, was significantly more frequent in patients with confirmed AHF in our study. This symptom reflects increased pulmonary capillary pressures and has been widely recognized as a clinical marker of decompensated heart failure [10]. Elevated jugular venous pressure (JVP),

another classical sign, was also found to be significantly associated with AHF, corroborating previous reports that JVP is a reliable and non-invasive marker of elevated right atrial pressure [11]. The presence of a third heart sound (S3 gallop) was notably more common in the AHF group, supporting earlier findings that auscultatory findings, while underutilized, hold important diagnostic value in heart failure assessment [12]. Furthermore, peripheral enema, although less specific, contributed to the predictive model and aligns with the systemic venous congestion commonly seen in heart failure [13]. Among biochemical markers, B-type natriuretic peptide (BNP) levels >500 pg./mL emerged as the most significant predictor. BNP is a well-established biomarker in diagnosing and ruling out AHF, with multiple studies confirming its high negative predictive value when levels are <100 pg./mL and strong positive predictive value when >500 pg./mL [14]. In our cohort, the elevated BNP levels in AHF patients strongly supported its utility, particularly in settings where echocardiography is not immediately available. Radiographic findings, such as cardiomegaly on chest X-ray, were also significantly more frequent in the AHF group, consistent with other studies emphasizing its role in supporting clinical judgment [15]. However, it must be noted that chest radiography alone lacks sensitivity in the early stages of AHF, and must be interpreted in conjunction with clinical and laboratory findings [16]. Our logistic regression model identified orthopnoea, S3 gallop, and BNP >500 pg./mL as independent predictors, similar to the findings by Mueller et al., who proposed a clinical scoring system incorporating these features for early identification of AHF [17]. Moreover, the mean age and comorbidity burden in our study population resemble that of broader epidemiological cohorts, further strengthening the generalizability of the findings [18-23]. The integration of easily identifiable bedside parameters with rapid biomarkers like BNP allows for more timely intervention, especially in resource-limited settings. This approach aids in lessening reliance on certain imaging techniques that could be inaccessible or could involve a longer wait time during peak hours in the ED. The clinical predictors in this study that were confirmed were noted because they are part of the established diagnostic criteria; this highlights the continued value of clinical reasoning despite the more sophisticated technology available. The findings justify the need for a more formalized diagnostic algorithm to be designed for older adults experiencing dyspnea.

LIMITATIONS

The findings of this study are constrained by its design as a single center study and the relatively small sample size. Not all patients had echocardiograms performed upon admission. Additionally, even after all diagnostic tools were utilized to distinguish between the disorders, the presence of overlapping pulmonary disorders may act as confounding variables, thus impacting the study's findings.

CONCLUSION

This Study identifies orthopnoea, S3 gallop, and BNP > 500 pg/mL as reliable clinical predictors for acute heart failure in older adults with dyspnea. These components allow rapid clinical assessments, expedite the initiation of crucial treatment measures, and, importantly, support emergency care settings in which advanced imaging technology is absent and cardiology backup is minimally available.

FUTURE FINDINGS

Future investigations on expanding a clinical scoring system should incorporate these predictors in determining diagnostic accuracy across different populations. Specifically, multisite studies with bigger sample sizes and the use of point-of-care ultrasound would inform refinements to preliminary diagnostic algorithms for acute heart failure in older adults presenting to the emergency department.

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Authors Contribution

Concept & Design of Study: **Fawad Ahmad1**

Data Collection: **Tayyaba2,**

Drafting: **Mehmood Ul Hassan3**

Data Analysis: **Fawad Ahmad1**

Critical Review: **Tayyaba2,**

Final Approval of version: **All Authors Approved the Final Version.**

Accountability: All authors contributed substantially to the conception, data collection, analysis, manuscript writing, and final approval of the study. Each author agrees to be accountable for all aspects of the work in accordance with **ICMJE authorship criteria**.

RESEARCH ETHICS STATEMENT

No animal studies were conducted for this research. The study received ethical approval from the Institutional Review Board **(IRB/1456/MTI/HMC/06/2022)**and-was carried out in accordance with the ethical principles of the **Declaration of Helsinki (2013)**. Written informed consent was obtained from all participants or their legal guardians prior to inclusion in the study. No identifiable human data were included. As described in the article and supplementary materials, the underlying data and findings are available in online repositories.

REFERENCE:

1. Aguilar-Iglesias L, Merino-Merino A, Sanchez-Corral E, Garcia-Sanchez MJ, Santos-Sanchez I, Dominguez-Calvo J, et al. Fast systematic geriatric assessment in acute heart failure patients admitted in Cardiology. Heart & lung : the journal of critical care. 2023;60:133-8.doi: https://doi.org/10.1016/j.hrtlng.2023.03.015.

2. Anker SD, Coats AJS. Exercise for Frail, Elderly Patients with Acute Heart Failure - A Strong Step Forward. The New England journal of medicine. 2021;385(3):276-7.doi: https://doi.org/10.1056/NEJMe2106140.

3. Candeloro M, Di Nisio M, Balducci M, Genova S, Valeriani E, Pierdomenico SD, et al. Prognostic nutritional index in elderly patients hospitalized for acute heart failure. ESC heart failure. 2020;7(5):2479-84. doi: https://doi.org/10.1002/ehf2.12812.

4. Carballo S, Stirnemann J, Garin N, Darbellay Farhoumand P, Serratrice J, Carballo D. Prognosis of patients eligible for dapagliflozin in acute heart failure. European journal of clinical investigation. 2020;50(6):e13245.doi: https://doi.org/10.1111/eci.13245.

5. Chang HC, Cheng HM, Huang WM, Lee CW, Guo CY, Yu WC, et al. Risk stratification in patients hospitalized for acute heart failure in Asian population. Journal of the Chinese Medical Association : JCMA. 2020;83(6):544-50.doi: https://doi.org/10.1097/jcma.0000000000000340.

6. Chopra VK, Anker SD. Anaemia, iron deficiency and heart failure in 2020: facts and numbers. ESC heart failure. 2020;7(5):2007-11. doi: https://doi.org/10.1002/ehf2.12797.

7. DeVore AD, Granger BB, Fonarow GC, Al-Khalidi HR, Albert NM, Lewis EF, et al. Effect of a Hospital and Postdischarge Quality Improvement Intervention on Clinical Outcomes and Quality of Care for Patients With Heart Failure With Reduced Ejection Fraction: The CONNECT-HF Randomized Clinical Trial. Jama.2021;326(4):314-23.doi: https://doi.org/10.1001/jama.2021.8844.

8. Emmons-Bell S, Johnson C, Roth G. Prevalence, incidence and survival of heart failure: a systematic review. Heart (British Cardiac Society). 2022;108(17):1351-60.doi: https://doi.org/10.1136/heartjnl-2021-320131.

9. Hamada T, Kubo T, Kawai K, Nakaoka Y, Yabe T, Furuno T, et al. Frailty in patients with acute decompensated heart failure in a super-aged regional Japanese cohort. ESC heart failure. 2021;8(4):2876-88. doi: https://doi.org/10.1002/ehf2.13363.

10. Hersberger L, Dietz A, Bürgler H, Bargetzi A, Bargetzi L, Kägi-Braun N, et al. Individualized Nutritional Support for Hospitalized Patients With Chronic Heart Failure. Journal of the American College of.Cardiology.2021;77(18):2307-19.doi: https://doi.org/10.1016/j.jacc.2021.03.232.

11. Ide T, Kaku H, Matsushima S, Tohyama T, Enzan N, Funakoshi K, et al. Clinical Characteristics and Outcomes of Hospitalized Patients With Heart Failure From the Large-Scale Japanese Registry Of Acute Decompensated Heart Failure (JROADHF). Circulation journal : official journal of the Japanese Circulation Society.2021;85(9):1438-50.doi: https://doi.org/10.1253/circj.CJ-20-0947.

12. Kamiya K, Sato Y, Takahashi T, Tsuchihashi-Makaya M, Kotooka N, Ikegame T, et al. Multidisciplinary Cardiac Rehabilitation and Long-Term Prognosis in Patients With Heart Failure. Circulation Heart.failure.2020;13(10):e006798.doi: https://doi.org/10.1161/circheartfailure.119.006798.

13. Kawanami S, Egami Y, Sugae H, Ukita K, Kawamura A, Nakamura H, et al. Predictors of bleeding events in acute decompensated heart failure patients with antithrombotic therapy: AURORA study. ESC heart failure.2023;10(2):1114-21.doi: https://doi.org/10.1002/ehf2.14277.

14. Khoury J, Ghersin I, Braun E, Elias A, Aronson D, Azzam ZS, et al. Adherence to Guidelines in Heart Failure, Is It Valid for Elderly Patients? The Israel Medical Association journal : IMAJ. 2022;24(11):757-62. doi:

15. Kitzman DW, Whellan DJ, Duncan P, Pastva AM, Mentz RJ, Reeves GR, et al. Physical Rehabilitation for Older Patients Hospitalized for Heart Failure. The New England journal of medicine. 2021;385(3):203-16. doi: https://doi.org/10.1056/NEJMoa2026141.

16. Murray EM, Whellan DJ, Chen H, Bertoni AG, Duncan P, Pastva AM, et al. Physical Rehabilitation in Older Patients Hospitalized with Acute Heart Failure and Diabetes: Insights from REHAB-HF. The American journal.of.medicine.2022;135(1):82-90.doi: https://doi.org/10.1016/j.amjmed.2021.08.001.

17. Namiuchi S, Tanita A, Sunamura S, Onodera K, Ogata T, Noda K, et al. Effect of constipation on readmission for heart failure in patients with acute heart failure. ESC heart failure. 2024;11(2):819-25. doi: https://doi.org/10.1002/ehf2.14650.

18. Obayashi Y, Kato T, Yaku H, Morimoto T, Seko Y, Inuzuka Y, et al. Tricuspid regurgitation in elderly patients with acute heart failure: insights from the KCHF registry. ESC heart failure. 2023;10(3):1948-60. doi: https://doi.org/10.1002/ehf2.14348.

19. Pandey A, Gilbert O, Kitzman DW. Physical frailty in older patients with acute heart failure: From risk marker to modifiable treatment target. Journal of the American Geriatrics Society. 2021;69(9):2451-4. doi: https://doi.org/10.1111/jgs.17306.

20. Poliwoda J, Eagles D, Yadav K, Nemnom MJ, Walmsley CG, Mielniczuk L, et al. Outcomes of acute heart failure patients managed in the emergency department.Cjem.2023;25(9):752-60.doi: https://doi.org/10.1007/s43678-023-00555-6.

21. Ponikowski P, Kirwan BA, Anker SD, McDonagh T, Dorobantu M, Drozdz J, et al. Ferric carboxymaltose for iron deficiency at discharge after acute heart failure: a multicentre, double-blind, randomised, controlled trial. Lancet (London, England). 2020;396(10266):1895-904.doi: https://doi.org/10.1016/s0140-6736(20)32339-4.

22. Rattarasarn I, Yingchoncharoen T, Assavapokee T. Prediction of rehospitalization in patients with acute heart failure using point-of-care lung ultrasound. BMC cardiovascula.disorders.2022;22(1):330.doi: https://doi.org/10.1186/s12872-022-02781-9.

23. Seko Y, Kishimori T, Kato T, Morimoto T, Yaku H, Inuzuka Y, et al. Coronary angiography in patients with acute heart failure: from the KCHF registry. ESC heart.failure.2022;9(1):531-44.doi: https://doi.org/10.1002/ehf2.13716.