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ORIGINAL ARTICLE

Clinical Factors Associated with in-Hospital Mortality Among Patients with Cardiogenic Shock Admitted to the Cardiology Department of Ayub Teaching Hospital

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ABSTRACT

Background: Cardiogenic shock (CS) is the most common complication of acute myocardial infarction**.** Our aim is to define the rate of in-hospital mortality and to evaluate the chosen clinical variables that relate to mortality in patients with cardiogenic shock.

Methods: A Hospital based descriptive observational study was conducted at the Department of cardiology, Ayub teaching hospital, Abbottabad from June 2025 to December 2025.There were 129 patients with cardiogenic shock aged 40-80 years, both male and females. Patients in cardiogenic or non-cardiogenic shock (e.g. septic, hypovolemic or anaphylactic shock), end-stage renal or hepatic failure, post cardiac surgical status, traumatic cardiac injury, pregnant or lactating women were excluded. During the admission process, demographic and clinical data such as age, sex, body mass index, symptoms duration, smoking status, socioeconomic status, occupation, education level, and location were taken in a systematic manner. Hospital follow-ups were done with the admitted patients throughout the hospital stay and the outcome was the in-hospital mortality. The relationship between the chosen clinical factors and mortality were determined.

Results: 35 (27.13%) patients were noted to die in-hospital. Among patients who died, male sex was present in 24 (68.57%), advanced age in 13 (37.14%), diabetes mellitus in 16 (45.71%), hypertension in 22 (62.86%), and obesity in 14 (40.0%). Comparison between mortality and survival groups on variables with denominations: There was no statistically significant difference in mortality and survival at $p<0.05$; hypertension exhibited a non-significant tendency towards increased mortality (OR 2.01, 95% CI 0.90-4.45, $p=0.084$).

Conclusion: Older age, male sex, diabetes mellitus, hypertension and obesity were found among patients with in-hospital mortality although the comparative analysis at hand failed to prove these factors to be independent predictors.

Keywords: cardiogenic shock, mortality, diabetes mellitus.

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Introduction

Cardiogenic shock (CS) represents de novo of hemodynamic conditions that carry a high mortality risk and is the most common complication of acute myocardial infarction, as well as of advanced cardiomyopathy, myocarditis, valvular heart diseases, or malignant arrhythmias.(1,2) Despite significant improvements in the diagnostic modalities and therapeutic options, cardiogenic shock remains a significant clinical concern because of its multifaceted

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pathophysiology and aggressive progression.(3)

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The related hemodynamic deficiency, metabolic dysfunction, and multi-organ impairment are the primary factors behind its progressively high global rate of death.(4)

Even the ratio of mortality due to cardiogenic shock has been reported to be significantly high despite the improvement in terms of interventional cardiology and critical care management measures, as there are still no standardized protocols of managing cardiogenic shock and its presentation is heterogeneous. (5,6) Although definitive therapy is urgent, absence of standard protocols and heterogenous presentation of cardiogenic shock tend to delay such measures. (7)

A number of clinical, biochemical and echocardiographic predictors of in-hospital mortality have been reported in cardiogenic shock patients. Other comorbidities like diabetes mellitus, hypertension of endemic nature, decreased left ventricular ejection fraction, raised levels of serum lactate and inflammatory cytokine have been assessed with regards to prognostic validity. (8) The presence of biomarkers such as cardiac troponins, B-type natriuretic peptide and inflammatory cytokines has also been analyzed with regards to prognostic validity. But there is inter-population variability caused by genetic differences, differences in the provision of health care, and treatment methods.(9)

Male gender (70.7%), advanced age (31.2%), diabetes mellitus (58%), hypertension (72%), and obesity (53.5%), are the predictors of in-hospital mortality of patients with cardiogenic shock as has been demonstrated in a study by Hashem KA, et al. (10)

Although international studies have identified several prognostic markers in cardiogenic shock, their findings cannot be directly generalized to Pakistani patients because of differences in baseline cardio-vascular risk profiles, delayed presentation, socioeconomic barriers, access to primary percutaneous coronary intervention, availability of intensive care resources, and differences in the use of advanced therapies such as mechanical circulatory support. Local data from tertiary cardiac units are therefore needed to define clinically relevant risk patterns in this population. This study was conducted at Ayub Teaching Hospital to describe the frequency of in-hospital mortality and to evaluate selected clinical factors associated with adverse in-hospital outcomes. The findings may support early risk recognition and guide future prospective studies designed to develop validated local prediction models.

Methods

This hospital-based descriptive observational study was carried out in the Department of Cardiology, Ayub Teaching Hospital, Abbottabad from June to December 2025. Approval was obtained from the ethical review committee via letter number RC-EA-2025 /152 dated 04.06. 2025.Using the WHO sample size calculator, a sample size of 129 was calculated, considering a confidence interval of 95%, a permissible error of 8%, and an expected occurrence of advanced age (31.2%) among individuals experiencing cardiogenic shock. Patients aged 40-80 years old of either gender who had cardiogenic shock (systolic blood pressure below 90 mm Hg persisted at least 30 minutes regardless of adequate fluid replacement) with evidence of insufficient tissue perfusion (including cold, sweaty skin,

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reduced urine output [less than 30 mL per hour], changes in consciousness [Glasgow Coma Scale score less than 13], or increased serum lactate levels above 2 mmol/L) were included. Individuals with shock due to non-cardiac causes (e.g., septic, hypovolemic, or anaphylactic shock), advanced malignancy, end-stage renal or hepatic failure, post-cardiac surgery status, traumatic cardiac injury, and pregnant or lactating women were excluded.

Prior to participation, each patient guardian provided informed consent after receiving a clear explanation of the study's objectives and potential benefits. At enrollment, essential demographic and clinical information including age, sex, body mass index, duration of symptoms, smoking history, socioeconomic background, occupation, educational attainment, and place of residence were systematically documented. Admitted patients were followed during hospital stay, In hospital mortality and the predictors were assessed. Data was noted on a proforma.

Selected clinical factors: The following variables were evaluated in relation to in-hospital mortality.

Male gender: This was defined as a patient that was biologically a male.

Advanced age: It was considered as patient who is over 70 years on NIC.

Diabetes mellitus: The FBS 126 mg/dl (after overnight fasting) and random blood sugar 200 mg/dl (laboratory test and/or medical record history) (hypoglycemic agent).

Hypertension: has been defined as being present when: 1) average systolic blood pressure of 140 mmHg or greater; 2) average diastolic blood pressure 90 mmHg or greater; or 3) a self-reported history of using antihypertensive drugs in the past 6 weeks.

Obesity: Obesity was defined as the body mass index (BMI) of 30 kg/m 2 or higher, calculated by taking the weight of a person (kg) divided by the square of height (m).

The data gathered were processed and analyzed with SPSS 26. Categorical variables such as gender, smoking, socioeconomic status, profession, educational level, residential status, advanced age (>70 years), diabetes mellitus, hypertension, obesity, and in-hospital mortality were analyzed with frequency percentages and percentages. The quantitative variables (age, BMI, duration of complaints) reported mean ± SD or median (IQR); the Shapiro-Wilk test was applied to test the normality. The chi-square test or Fisher exact test was used to compare mortality and survival groups depending on the test. The odds ratios (ORs), 95 percent confidence intervals (CIs), and p-values of the variables that had denominators were calculated using univariate logistic regression. A p-value <0.05 was considered statistically significant. Multivariable logistic regression was not reliably conductable since individual level data of some of the known prognostic variables were not available or complete.

Results

The participants of the study were aged between 40 and 80 with a mean age of 65.05 + / - 6.08 years. As cited by Table 1, most of the patients, 80 (62.02%), fell under the age of 61-80 years.

Table-1: Distribution of patients according to Age (n=129).

Age (in years)	No. of Patients	%age
40-60	49	37.98
61-80	80	62.02
Total	129	100.0

The figure I shows the 1:1 ratio of males and females with 77 (59.69) males and 52 (40.31) females constituting 129 patients. The average height was 158.44 ± 12.35 cm. The average weight was 89.67 ± 9.84 kg. According to Table 2, the mean BMI was 28.57 ± 3.76 kg/m2. The symptoms took an average of 14.89 ± 11.23 hours.

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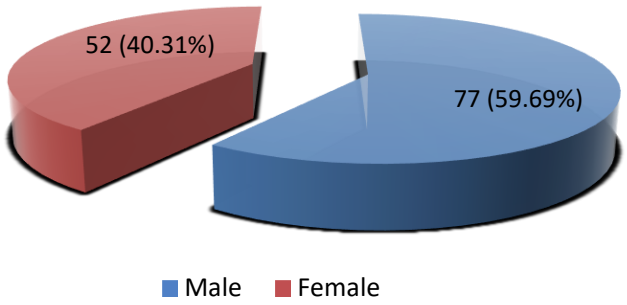

Figure 1: Distribution of patients according to gender (n=129).

Table 2 shows the distribution of patients according to some of the confounding variables.

Table 2: Distribution of patients according to different variables (n=129)

Variable	Category	Frequency	%age
Hypertension	Yes	65	50.39
	No	64	49.61
Diabetes mellitus	Yes	71	55.04
	No	58	44.96
Obesity	Yes	61	47.29
	No	68	52.71
Smoking	Yes	52	40.31
	No	77	59.69
Residence	Rural	57	44.19
	Urban	72	55.81
Socioeconomic status	Poor	35	27.13
	Middle	42	32.56
	Upper	52	40.31
Employment	Unemployed	58	44.96
	Employed	71	55.04
Education	Uneducated	42	32.56
	Educated	87	67.44

The difference in in-hospital mortality among patients having cardiogenic shock was 35 (27.13%) in this study (Figure 2).

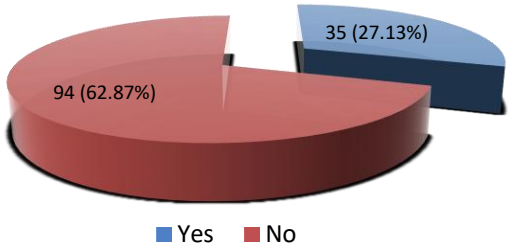

Figure 2: In-hospital mortality in patients with cardiogenic shock (n=129).

Table 3 indicates the differences in the clinical factors selected between mortality and survival groups. Available denominators were used to evaluate male sex, hypertension, diabetes mellitus and obesity; no statistically significant relationship was found between them and in-hospital mortality at $p<0.05$. The presence of advanced age was observed in 13 (37.14%) patients in the mortality group though no comparison was done due to the fact that the number of patients aged over 70 years was not available as a whole.

Table 3: Comparison of selected clinical factors between mortality and survival groups

Clinical factor	Mortality group n=35	Survival group n=94	OR (95% CI)	p-value
Male sex	24 (68.57%)	53 (56.38%)	1.69 (0.74-3.84)	0.210
Advanced age (>70 years)	13 (37.14%)	Not available	Not analyzed	Not analyzed
Hypertension	22 (62.86%)	43 (45.74%)	2.01 (0.90-4.45)	0.084
Diabetes mellitus	16 (45.71%)	55 (58.51%)	0.60 (0.27-1.30)	0.194
Obesity	14 (40.0%)	47 (50.0%)	0.67 (0.30-1.47)	0.312

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Discussion

This study was aimed at establishing the rate of in-hospital mortality as well as to assess some of the clinical variables that were related to mortality in patients presenting with cardiogenic shock. The difference in in-hospital mortality among patients having cardiogenic shock was 35 (27.13%) in our study. This is lower than a number of historical studies have reported of a higher mortality with cardiogenic shock was over 70 percent prior to the widespread access to revascularization, then reducing to about 30-40 percent in cohorts with more recent date of entry. (11,12) Diversity across centers can be due to variation in case mix, timeliness of presentation, access to revascularization, availability of intensive care, and definition of cardiogenic shock.(13,14)

In our research, most of the patients were male (59.69 percent) with a mean age of 65.05 +_6.08 years. Among patients who died, 24 (68.57%) were male and 13 (37.14%) had advanced age. The revised analysis however does not confirm the opined statement that male sex or older age was an independent predictor of mortality in this cohort. The prior findings indicated that older age and shock severity are a significant predictor of short-term survival in cardiogenic shock, and ideally the use of structured classification scales like the SCAI shock stages should be incorporated in future locally-based studies.(15,16,17,181,19,20)

The presence of hypertension was found in 22 (62.86%) patients in mortality group, which had a non-significant deviation towards the higher mortality at the univariate analysis (OR 2.01, 95% CI 0.90-4.45, p=0.084). Thus, hypertension is not to be regarded as an independent predictor, but common clinical feature in this dataset. In the available data, blood pressure at presentation, heart rate, shock index and modified shock index were not statistically examined; the variables must be included in future prospective studies since findings from previous research have indicated that all of these variables have the potential to be prognostic.(21,22)

An underlying diagnosis of diabetes mellitus was found in 16 (45.71%) mortality group. Upon univariate comparison available, no significant association was found between diabetes mellitus and in-hospital mortality (OR 0.60, 95% CI 0.27-1.30, p=0.194). Such an outcome must be approached with caution since diabetes has been identified to lead to poorer outcomes in numerous observational studies and meta-analysis of cardiogenic shock, whereas other studies have shown inconclusive results.(23,24)

Obesity was found in 14 (40.0%) patients of the mortality group, and it was not significantly related to mortality in both the provided univariate comparison (OR 0.67, 95% CI 0.30-1.47, p=0.312). Previous literature proposes the possibility that obesity can affect the outcomes in cardiogenic shock, especially in patients needing mechanical circulatory support, which the study was not powered to investigate the obesity classes, procedural complications, and advanced heart failure treatments.

Limitations of Study

There are various limitations to this study. First, it was also undertaken in one institution during a specific time - this constraint is a limitation to generalizing to other larger populations and other healthcare environments. Second, the authors of the study had to use the available clinical records and aggregate data, meaning that multivariable logistic regression and confounding correction was not feasible. Third, some of the prognostic variables that had been established in literature were not in

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complete analyzable form, such as serum lactate trends, creatinine/renal function, left ventricular ejection fraction, Killip class or SCAI shock stage, culprit vessel, PCI/revascularization status and mechanical ventilation, vasopressor/inotrope need, intra-aortic balloon pump use, and extracorporeal membrane oxygenation. Their absence minimizes the capability to determine independent predictors. Fourth, the sample size was adequate to conduct descriptive analysis but might be underpowered to conduct subgroup analyses and regressions. Better off to multicenter prospective studies including standardized data collection and long-term follow ups are needed to confirm independent predictors and risks prediction models to the local practice.

Conclusion

Among patients with in-hospital mortality in this cohort, old age, male sex, diabetes mellitus, high blood pressure and obesity were noted. But comparative analysis available did not predetermine these factors as independent predictors. Independent predictors and subsequent validated risk prediction models would need larger multicenter prospective studies with multivariable regression analyses and established prognostic factors including lactate, renal, LVEF, SCAI stage, revascularization, and mechanical circulatory support.

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References

1. Hamzaoui O, Boissier F. Hemodynamic monitoring in cardiogenic shock. J Intensive Med. 2022;3(2):104-13. DOI: https://doi.org/10.1016/j.jointm.2022.10.003
2. Yuen T, Senaratne JM. Definition, classification, and management of primary noncardiac causes of cardiogenic shock. Can J Cardiol. 2025;41(4):587-604. DOI: https://doi.org/10.1016/j.cjca.2024.12.014
3. Jung C, Bruno RR, Jumean M, Price S, Krychtiuk KA, Ramanathan K, et al. Management of cardiogenic shock: state-of-the-art. Intensive Care Med. 2024;50(11):1814-29. DOI: https://doi.org-/10.1007/s00134-024-07618-x
4. Laghlam D, Benghanem S, Ortuno S, Bouabdallaoui N, Manzo-Silberman S, Hamzaoui O, et al. Management of cardiogenic shock: a narrative review. Ann Intensive Care. 2024;14(1):45-8. DOI: https://doi.org/10.1186/s13613-024-01260-y
5. Thiele H, Zeymer U, Akin I, Behnes M, Rassaf T, Mahabadi AA, et al. Extracorporeal life support in infarct-related cardiogenic shock. N Engl J Med. 2023;389(14):1286-97.DOI:https://doi.org-/10.1056/NEJMoa2307227
6. Aissaoui N, Puymirat E, Delmas C, Ortuno S, Durand E, Bataille V, et al. Trends in cardiogenic shock complicating acute myocardial infarction. Eur J Heart Fail. 2020;22(4):664-72.DOI:https://doi.org-/10.1002/ejhf.1750
7. Olarte N, Rivera NT, Grazette L. Evolving presentation of cardiogenic shock: a review of the medical literature and current practices. Cardiol Ther. 2022;11(3):369-84. DOI: https://doi.org/10.1007/s40119-022-00274-6
8. Javed N, Itare V, Allu SVV, Penikilapate S, Pandey N, Ali N, et al. Burden and predictors of mortality related to cardiogenic shock in the South Bronx population. Am J Cardiovasc Dis. 2024;14(6):355-67.DOI:https://doi.org-/10.62347/HYCA6457

DOI: https://doi.org/10.59736/IJP.24.02.1081

9. Jozwiak M, Lim SY, Si X, Monnet X. Biomarkers in cardiogenic shock: old pals, new friends. Ann Intensive Care. 2024;14(1):157-61.DOI:https://doi.org-/10.1186/s13613-024-01388-x
10. Hashmi KA, Abbas K, Hashmi AA, Irfan M, Edhi MM, et al. In-hospital mortality of patients with cardiogenic shock after acute myocardial infarction: impact of early revascularization. BMC Res Notes. 2018;11(1):721-5.DOI:https://doi.org-/10.1186/s13104-018-3830-7
11. Laghlam D, Benghanem S, Ortuno S. Management of cardiogenic shock: a narrative review. Ann Intensive Care. 2024;14(1):45.DOI:https://doi.org/10.1186/s13613-024-01260-y
12. Alkhunaizi FA, Smith N, Brusca SB. The Management of Cardiogenic Shock From Diagnosis to Devices: A Narrative Review. CHEST Crit Care. 2024;(2):100071. DOI: https://doi.org/10.1016/j.chstcc.2024.100071
13. Blumer V, Kanwar MK, Barnett CF. Cardiogenic Shock in Older Adults: A Focus on Age-Associated Risks and Approach to Management: A Scientific Statement From the American Heart Association. Circulation. 2024;149(14):1051-e1065. DOI: https://doi.org/10.1161/CIR.0000000000001214
14. Tyler JM, Brown C, Jentzer JC. Variability in reporting of key outcome predictors in acute myocardial infarction cardiogenic shock trials. Catheter Cardiovasc Interv. 2022;99(1):19-26.DOI:https://doi.org-/10.1002/ccd.29710
15. Jentzer JC, Schrage B, Holmes DR, Dabboura S, Anavekar NS, Kirchhof P, et al. Influence of age and shock severity on short term survival in patients with cardiogenic shock. Eur Heart J Acute Cardiovasc Care. 2021; 10:604-612.DOI:https://doi.org-/10.1093/ehjacc/zuaa035
16. Izadfar R, Ziaie N, Jalali F, Tayebi P, Ahangar HG. Predictors of 30-Day Mortality in Patients with Heart Failure Presenting with Cardiogenic Shock. Pak Heart J. 2025;58(01):17-23. DOI: https://doi.org/10.47144/phj.v58i1.2771
17. Acharya D. Predictors of outcomes in myocardial infarction and cardiogenic shock. Cardiol Rev. 2018;26:255-66. DOI: https://doi.org/10.1097/CRD.0000000000000190
18. Shah M, Patel B, Tripathi B, Agarwal M, Patnaik S, Ram P, et al. Hospital mortality and thirty-day readmission among patients with non-acute myocardial infarction related cardiogenic shock. Int J Cardiol. 2018;270:60-67.DOI:https://doi.org-/10.1016/j.ijcard.2018.06.036
19. Baran DA, Long A, Badiye AP, Stelling K. Prospective validation of the SCAI shock classification: single center analysis. Catheter Cardiovasc Interv. 2020; 96:1339-1347. DOI:https://doi.org/10.1002/-ccd.29319
20. Damluji AA, Forman DE, van Diepen S, Alexander KP, Page RL 2nd, Hummel SL, et al. Older adults in the cardiac intensive care unit: factoring geriatric syndromes in the management, prognosis, and process of care: a scientific statement from the American Heart Association. Circulation. 2020;141.DOI:https://doi.org/10.1161/CIR.0000000000000741
21. Pourafkari L, Wang CK, Schwartz M, Nader ND. Does shock index provide prognostic information in acute heart failure? Int J Cardiol. 2016; 215:140-2. DOI: https://-doi.org/10.1016/j.ijcard.2016.04.083
22. Schmitz T, Harmel E, Linseisen J, Kirchberger I, Heier M, Peters A, et al. Shock index and modified shock index are predictors of long

DOI: https://doi.org/10.59736/IJP.24.02.1081

term mortality not only in STEMI but also in NSTEMI patients. Ann Med. 2022;54(1):900-8. DOI: https://doi.org/10.1080/07853890.2022.2056240

23. Tolenaar JL, Froehlich W, Jonker FHW. Predicting in-hospital mortality in acute type B aortic dissection: evidence from International Registry of Acute Aortic Dissection. Circulation.2014;130(11Suppl1).-DOI:https://doi.org/10.1161/CIRCULATIONAHA.113.007117
24. Luo C, Chen F, Liu L, Ge Z, Feng C, Chen Y. Impact of diabetes on outcomes of cardiogenic shock: a systematic review and meta-analysis. Diabetes Vasc Dis Res. 2022. DOI:https://doi.org/10.1177/14791641221132242
25. Sreenivasan J, Khan MS, Sharedalal P, Hooda U, Fudim M, Demmer RT, et al. Obesity and outcomes following cardiogenic shock requiring acute mechanical circulatory support.Circ-HeartFail.2021;14.DOI:https://doi.org/10.1161/CIRCHEARTFAILURE.120.007937
26. Hales CM, Carroll MD, Fryar CD, Ogden CL. Prevalence of obesity and severe obesity among adults: United States, 2017-2018. NCHS Data Brief. 2020;1-8. DOI: No DOI found / likely no DOI assigned.
27. Sharma A, Lavie CJ, Borer JS, Vallakati A, Goel S, Lopez-Jimenez F, et al. Meta-analysis of the relation of body mass index to all-cause and cardiovascular mortality and hospitalization in patients with chronic heart failure. Am J Cardiol. 2015; 115:1428-34.DOI:https://doi.org/10.1016/j.amjcard.-2015.02.024
28. Carbone S, Lavie CJ. Disparate effects of obesity on survival and hospitalizations in heart failure with preserved ejection fraction. Int J Obes (Lond). 2020; 44:1543-45. DOI: https://doi.org/10.1038/s41366-020-0579-6
29. Ventura HO, daSilva-deAbreu A, Lavie CJ. Obesity is a heavy load in cardiogenic shock and mechanical circulation. Circ Heart Fail. 2021;14. DOI: https://doi.org/10.1161/CIRCHEARTFAILURE.121.008300.

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Data acquisition, analysis and interpretation	MUK, MZI,YAS
Manuscript writing and approval	SAS, BA, YAS,NM
All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.	