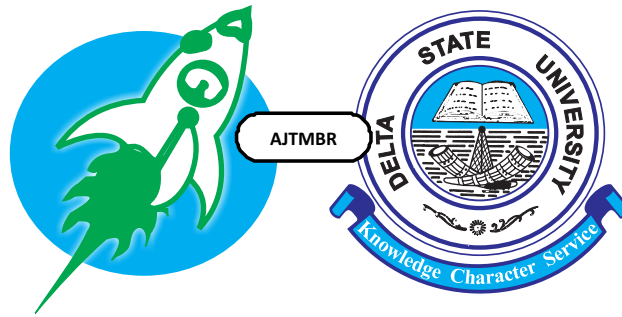# African Journal of Tropical Medicine and Biomedical Research (AJTMBR)

The Journal is the Official Publication of the College of Health Sciences, Delta State University, Abraka, Nigeria.

Focus and Scope

The African Journal of Tropical Medicine and Biomedical Research is a multidisciplinary and international journal published by the College of Health Sciences, Delta State University of Abraka, Nigeria. It provides a forum for Authors working in Africa to share their research findings on all aspects of Tropical Medicine and Biomedical Sciences and to disseminate innovative, relevant and useful information on tropical medicine and biomedical sciences throughout the continent. The journal will publish original research articles, reviews, editorials, commentaries, short reports, case reports and letters to the editor. Articles are welcome in all branches of medicine and dentistry including basic sciences (Anatomy, Biochemistry, Physiology, Pharmacology, Psychology, Nursing etc) and clinical sciences (Internal Medicine, Surgery, Obstetrics and Gynaecology, Dental surgery, Child Health, Laboratory Sciences, Radiology, Community Medicine, etc). Articles are also welcome from social science researchers that document the intermediating and background social factors influencing health in countries of Africa. Priority will be given to publication of articles that describe the application of the principles of primary health care in the prevention and treatment of diseases.

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Common Precipitants of Acute Decompensated Heart Failure

Ogbemudia, EJ, Umuerri, EM

Abstract

Introduction: Acute decompensated heart failure (ADHF) is a common acute heart failure syndrome, and it is often caused by certain factors called precipitants. However, the common precipitants of ADHF in our locale have not been well documented.
Aim: To determine the common factors that precipitate acute decompensated heart failure in our locale.
Materials and Method: This was a retrospective study of acute heart failure patients hospitalized from January 2019 to June 2020 in a university teaching hospital. The age, gender, blood pressures were extracted from the records. Others included the cause of heart failure, precipitant of acute decompensation and left ventricular ejection fraction. The data were managed as appropriate, and p values less than 0.05 were statistically significant.
Results: There were 165 cases of ADHF and 86 (52.1%) were males with a median age of 57 years. Precipitants of ADHF were identified in 128(77.6%) of cases. The prevalence of the precipitants were pneumonia (PMN) 66 (51.5%), poor drug adherence (PDA) 47(36.7%), arrhythmia 38 (29.7%), urinary tract infections (UTI) 16.4% and renal dysfunction (10.2%). The others were acute exacerbation of chronic obstructive pulmonary disease (COPD) (6.3%), severe hypertension (4.7%). The association of PMN, PDA and arrhythmias among age groups yielded p values of 0.019, 0.010 and 0.016, respectively.
Conclusion: Most cases of ADHF (77.6%) are caused by precipitants. Pneumonia, poor drug adherence and arrhythmias are the common precipitants of ADHF, and they are associated with the elderly. Therefore, these factors should be actively sought for during initial evaluation, and measures for prevention initiated.
Keywords: Acute decompensated heart failure, precipitant, common

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Introduction

Acute decompensated heart failure (ADHF) is the sudden or gradual worsening of heart failure symptoms in a previously stable HF patient.[1] It is one of the acute heart failure (AHF) syndromes, a common medical cause of hospitalization. Hospitalizations for ADHF contribute significantly (70%) to the economic burden of its management.[2]

The precipitant of ADHF is usually an acute illness not related to the evolution of the primary cardiac disease. It worsens cardiac function and has prognostic implications.[3,4] Fortunately, some precipitants such as poor drug adherence (PDA) are preventable.[5,6]

Early identification and adequate management of the precipitant optimizes the treatment of ADHF, which positively

influences outcomes. However, the common factors that precipitate ADHF have not been well documented in our locale. Indeed, the prevalence of the different precipitants of ADHF has not been extensively investigated.

In a study of the pattern, precipitants, and short-term outcomes of heart failure, Baba et al. [7] reported chest infections, poor drug adherence and urinary tract infections as the common precipitants of ADHF, but the associated factors were not determined. Furthermore, the study was conducted in North-eastern Nigeria, a region with significant socio-cultural differences from the South. Ogah et al., [8] also documented factors that precipitate AHF in a study of the contemporary profile and clinical characteristics of HF patients, but they were not highlighted because it was not the study's primary objective. The common factors that precipitate ADHF in our locale therefore need to be further investigated.

This study's information should expedite the initial evaluation of patients with ADHF in the emergency room in terms of early identification of the precipitant of exacerbation and institution of appropriate therapy. It should also inform stakeholders on appropriate measures to initiate to forestall repeated exacerbations of HF.

Therefore, this study aims to determine the common factors that precipitate ADHF in our practice.

Materials and Methods
This retrospective cross-sectional study of patients hospitalized for acute decompensated heart failure was conducted in the medical wards of a tertiary health centre. The hospital's research and ethics committee reviewed and approved the protocol, and the principles of the Helsinki declaration guided the conduct of the study.

The minimum sample size was determined with the Fisher statistical formula: $z^2 p (1 - p)/d^2$. The prevalence of AHF applied was 11% [9] with a confidence interval of 95% (1.96) and degree of accuracy set at 0.05. This gave a sample size of 150; an attrition rate of 10% was applied, which gave a final number of 165. Data of patients with ADHF hospitalized from January 2019 to June 2020 were retrieved from the records. They included age, gender, New York Heart Association (NYHA) functional class and blood pressure. Others were the aetiology of HF, the precipitants and left ventricular ejection fraction.

Definition of Terms
Acute decompensated heart failure: Worsening dyspnoea in a previously stable heart failure patient (NYHA class 3 or 4).
Pneumonia: A history of cough and fever with abnormal chest signs and infiltrates on chest x-ray.
Poor drug adherence: Was determined by patents' self-reported failure to take medications daily as prescribed.
Atrial fibrillation: Absent P waves, irregular narrow QRS complexes with a fibrillar baseline.
Ventricular tachycardia: Regular broad complex tachycardia with fusion or capture beats.
Urinary Tract Infection: Clinical features of cystitis (dysuria, frequency) or pyelonephritis (fever and flank pain) and abnormal urine microscopy with or without a positive urine culture.
Renal dysfunction: Glomerular filtration rate < 60mls/min in the setting of concomitant acute or chronic renal disease (cardiorenal syndrome type 3 and 4)

Acute Exacerbation of chronic obstructive pulmonary disease (COPD): Cough, dyspnoea and wheeze in a previously stable COPD patient.

Severe Hypertension: Features of acute pulmonary oedema with blood pressure greater than 160/100mmHg

Acute myocardial infarction (AMI): The diagnosis of AMI was made based on one or more of the following: Symptoms of myocardial ischaemia, significant ST-segment / T wave changes, and new left bundle branch block (LBBB) and development of pathological Q waves in the presence of elevated cardiac troponin T.

Acute pulmonary embolism (APE): Symptoms suggestive of PE (dyspnoea, chest pain) with D-dimers' elevation and confirmed on CT pulmonary angiography.

Data Analysis:
Data analysis was with the Statistical Product and Service Solutions (SPSS) version 20 Inc. Chicago, Il, USA software. Continuous variables such as the age, blood pressure and ejection fraction were expressed as median and interquartile ranges. The gender, age group, blood pressure category and cause of

heart failure were expressed as frequencies. Comparisons were made with the chi-square test, and p values < 0.05 were considered statistically significant.

The cases were grouped into three age groups, the young (18 – 39), middle-aged (40 – 64) and the elderly (65 and above).[10] Systolic blood pressures < 100mmHg were categorized as low blood pressure, while 100 - 139mmHg and ≥ 140mm Hg were grouped as normal and high blood pressure groups, respectively. Ejection fraction ≤ 40%, 41% to 49% and ≥ 50% were described as HF with reduced, mid-range and preserved ejection fractions, respectively.

Results:
One hundred and sixty – fifty (165) cases of ADHF were studied with a median age of 57 years. Nineteen (11.5%) had no formal education, while 65 (39.4%) ,39 (23.6%), and 42 (25.4%) had primary, secondary and tertiary levels of education respectively. Precipitants of ADHF were identified in 128 (77.6%) of cases. but no precipitant was identified in 37 (22.4%). Sixty - five (50.8%) of those cases with precipitant had only one precipitant, while 63 (49.2%) had more than one precipitant of ADHF.

TABLE 1: BASELINE DEMOGRAPHIC AND CLINICAL VARIABLES OF ALL CASES

Clinical characteristics	Median	IQR
AGE (yrs)	57.0	49.5-70.5
SBP (mmHg)	120.0	110.0-150.0
DBP (mmHg)	80.0	70.0-100.0
MAP (mmHg)	97.0	27 – 173.0
LVEF (%)	38.0	25.2-45.0

SBP - Systolic blood pressure, **DBP** - Diastolic blood pressure, **LVEF** - Left ventricular ejection fraction, **IQR** – Inter quartile range, **MAP** – Mean arterial pressure

TABLE 2: DISTRIBUTION OF CASES AMONG DEMOGRAPHIC AND CLINICAL VARIABLES

Clinical characteristics	Categories	No (%)
Sex	Male	86 (52.1)
	Female	79 (47.9)
Age group	Young	23 (13.9)
	Middle	81 (49.1)
	Elderly	61 (37.0)
NYHA class	111	41 (24.8%)
	1V	124 (75.2%)
Blood pressure group	Low	25 (15.2)
	Normal	85 (51.5)
	High	55 (33.3)
Cause of heart failure	CMP	26 (15.8)
	CONG	5 (3.0)
	COPUL	12 (7.3)
	HHD	82 (49.7)
	RHD	40 (24.2)
Left ventricular ejection fraction	HFmrEF	43 (26.0)
	HFpEF	30 (18.2)
	HFrEF	92 (55.8)

CMP: Cardiomyopathy, CONG: Congenital heart disease, COPUL: Cor pulmonale, HHD: Hypertensive heart disease, RHD: Rheumatic heart disease, HFpEF: Heart failure with preserved ejection fraction, HFmrEF: Heart failure with mid-range ejection fraction, HFrEF: Heart failure with reduced ejection. NYHA – New York Heart Association

FIGURE 2: FREQUENCY OF PRECIPITANTS OF ACUTE DECOMPENSATED HEART FAILURE
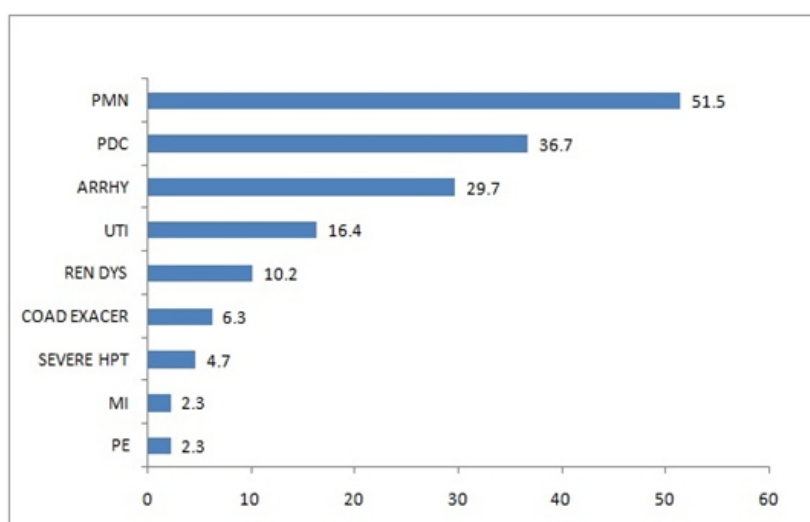
PMN– Pneumonia, **PDC** – Poor Drug Compliance, **ARRYH**– Arrhythmia, **UTI** – Urinary Tract Infection, **RENAL DYS** – Renal Dysfunction, **COAD EXACER** - Acute Exacerbation of Chronic obstructive airway disease, **HPT**-SevereHypertensive, **MI** – Myocardial infarction, **PE** – Pulmonary embolism

TABLE 3: ASSOCIATION BETWEEN COMMON PRECIPITANTS OF ACUTE DECOMPENSATED HEART FAILURE AND CLINICO - DEMOGTRAPHIC VARIABLES

VARIABLE	PMN	P	PDA	P	ARRHY	P
SEX						
Male	30(50.0)	0.215	30(50.0	0.515	12(20.0)	0.217
Female	40(58.8)		27(39.7)		12(17.6)	
AGEGROUP						
Young	7(50.0)	0.019	4(28.6)	0.010	2(14.3)	0.016
Middle	23(40.4)		13(22.8)		8(14.0)	
Elderly	40(70.2)		40(70.2)		14(24.6)	
CAUSE OF HF						
CMP	8(40.0)	0.572	9(45.0)	0.823	3(15.0)	0.273
CONG	1(33.3)		2(66.7)		0(0.0)	
COPUL	4(40.0)		4(40.0)		0(0.0)	
HHD	43(63.2)		35(51.5)		16(23.5)	
RHD	14(51.9)		7(25.9)		5(18.5)	

PMN: Pneumonia, **PDA:** Poor drug adherence, **ARRHY:** Arrhythmia, **HF;** Heart Failure, **CMP:** Cardiomyopathy, **CONG:** Congenital heart disease, **COPUL:** Cor pulmonale, **HHD:** Hypertensive heart disease, **RHD**: Rheumatic heart disease

Discussion

This study has revealed that pneumonia is the most common precipitant of ADHF 66 (51.5%) in our practice. This is not surprising, because HF patients are susceptible to chest infections which further worsens cardiac function.[11, 12] Pneumonia increases circulatory levels of inflammatory cytokines and induces hypoxia via ventilation/perfusion mismatch. These factors (cytokines and hypoxia) suppress ventricular function and trigger arrhythmias, further undermining cardiac function.[13] Baba et al.[7] and Ogah et al.[8] reported likewise. The similarity in the populations studied can explain this concordance. However, this result differs from that of Foranow et al.,[14] who reported acute coronary syndrome (ACS) as the most common precipitant of ADHF in the OPTIMIZE - HF study. This difference is most probably due to the high prevalence of coronary artery disease (CAD) in the developed countries where the study was conducted.[15]

Poor drug adherence (PDA) is another common precipitant 47 (36.7%) of ADHF. This is a significant proportion, but fortunately, it is preventable if patients are adequately counseled and motivated. PDC cause fluid retention and increases after load, both of which reduce myocardial performance. Improvement in symptoms and the burden of taking multiple pills daily are possible reasons for this observation. Financial constraints in the purchase of medications could also be a factor, particularly in a low resource setting like Nigeria.

Arrhythmias are also common precipitants of ADHF 38 (29.7%). This is not unexpected because of the interrelationship between arrhythmias and HF. HF is a cause of arrhythmias and arrhythmias (particularly

new onset) also worsens HF. Therefore, it may be a challenge to ascertain which started first; both conditions should be treated simultaneously as recommended.[16] Tachycardia, irregular rhythm and atrioventricular dissociation are mechanisms by which arrhythmias cause dysfunction and induce hemodynamic derangement in stable HF patients. Others include loss of atrial contribution to ventricular filling. Ventricular arrhythmias also trigger ADHF, but they are less commonly encountered, probably because they cause cardiac arrest and sudden cardiac death when sustained.

It is pertinent to note that although HHD was the most common aetiology of HF(49.7%) as shown in table 2, only 4.7% of the precipitants were due to severe hypertension (figure 1). This is not surprising, because severe hypertension typically precipitates HF in the setting of hypertensive emergencies such as the classical acute left ventricular failure, which usually presents as denovo (new onset) HF. Only cases of decompensated chronic HF were enrolled in this study. The absence of infective endocarditis within the period studied reflects the ongoing improvement in healthcare notably better availability of antibiotics.

There was no significant association between the aetiology of heart failure and the common precipitants of ADHF. (Table 3) This agrees with the results of a study by Ogbemudia and Obasohan.[17] They were, however, significantly associated with the elderly (Table 3). The elderly are susceptible to infections, particularly pneumonia, because of reduced cellular and humoral mediated immunity, impaired mucociliary clearance and cough reflex. The presence of heart disease alongside other comorbidities further increases this risk.[18, 19] Arrhythmias

are also more common in the elderly. The prevalence of arrhythmias, particularly atrial fibrillation, increases with age, due to age-related structural and electrical remodelling, which results in fibrosis.[20] This study also shows that the elderly are associated with poor drug adherence. Polypharmacy due to multiple comorbidities, forgetfulness, and cost-related issues are some barriers to good drug adherence in the elderly.

Precipitants of HF exacerbations were identified in 77.6% of cases (see results). This confirms the fact that ADHF is usually triggered by precipitants which are identifiable in most cases. However, precipitants may not be detected in some cases even after an exhaustive search as in 22.4% in this study. Progressive ventricular dysfunction is the most likely cause of deterioration in these cases. Adhikari et al.[21] reported a higher prevalence of precipitants in their study (95% of cases) because; they identified other precipitants such as dietary salt, fluid indiscretion, and usage of non-prescription medications with adverse cardiac effect such as non-steroidal anti-inflammatory drugs and others.

Implications for future research include the need to follow up these patients with common precipitants and monitor outcomes (rehospitalisation and mortality). A comparison of the distribution of precipitants of ADHF among acute heart failure syndromes and assessment of possible barriers to good drug adherence is also necessary. The retrospective study design was a limitation in this study. Patient education and adherence could not be objectively assessed, and it was a single-centre study which limits its generalisation.

In conclusion, ADHF is a common AHF syndrome that is usually precipitated by factors that can be identified in most cases

(77.6%). Besides, pneumonia, PDC and arrhythmias are the common factors that precipitate ADHF in our locale, and they were associated with the elderly age group. Therefore, an active search for these factors is necessary during the initial evaluation of patients with ADHF to optimise management and improve outcomes. Interventions such as vaccination against pneumonia, health education/counseling on drug adherence and other self-care practices will help prevent recurrence, reduce repeated exacerbations and hospitalization for ADHF, and the associated economic burden.

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