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Incidence of atrial fibrillation in acute respiratory emergency and exacerbation of chronic lung disease

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ABSTRACT

Background and Objectives: Atrial fibrillation (AF), a prevalent arrhythmia linked to mortality, demonstrates a bidirectional relationship with chronic lung diseases like chronic obstructive pulmonary disease, asthma, pulmonary fibrosis due to shared mechanisms such as hypoxia and inflammation. Acute respiratory emergencies further exacerbate this risk. This study aimed to determine the incidence of AF in patients with acute respiratory emergencies or chronic lung disease exacerbations in Sulaimaniyah, Iraq.

Methods: An observational cross-sectional study was conducted at Shar Teaching Hospital from 1st March 2024 to 28th February 2025. A convenience sample of 100 adult's patient admitted with acute respiratory emergencies or chronic lung disease exacerbations underwent a12-lead ECG at the time of admission.

Results: AF was detected in 14% of patients on admission. The mean age was 60.4 ± 14.3 years, and 58% were female. AF was more frequent in patients with COPD (20%) and obstructive sleep apnea (OSA, 42.9%), as well as in those with higher C-reactive protein (CRP) levels and lower oxygen saturation (SpO_2) on admission (p=0.001 and p=0.012, respectively). Most AF cases were transient, resolving by discharge in all but one patient. No significant associations were found between AF and age, sex, or smoking status.

Conclusion: AF is a notable and often transient complication in patients with acute respiratory emergencies, particularly among those with COPD, OSA, hypoxemia, and elevated inflammation. Routine monitoring for AF is recommended in high-risk respiratory patients

Keywords: Pulmonary Disease, Respiratory Insufficiency, Hypoxia

1. INTRODUCTION

Atrial fibrillation (AF), the most common sustained cardiac arrhythmia, is associated with significant morbidity and mortality, including heightened risks of stroke, heart failure, and systemic embolism.[1] The global prevalence of atrial fibrillation is 37.574 million instances, constituting 0.51% of the global population, and has risen by 33% during the last 20 years.[2]

This arrhythmia is particularly prevalent among individuals with acute or chronic respiratory conditions, where overlapping pathophysiological mechanisms—such as hypoxia, systemic inflammation, and autonomic dysfunction—create a bidirectional interplay between pulmonary and cardiovascular systems.[3, 4]

Acute respiratory emergencies, including pneumonia, acute asthma exacerbations, and acute respiratory distress syndrome (ARDS), impose abrupt physiological stressors such as hypoxemia, hypercapnia, and cytokine surges, all of which may precipitate AF.[5, 6] Similarly, exacerbations of chronic lung diseases, such as chronic obstructive pulmonary disease (COPD), asthma, interstitial lung disease (ILD), and bronchiectasis, amplify cardiovascular risk due to sustained inflammation and gas exchange abnormalities.[5, 7, 8]

In acute settings, the incidence of AF varies widely depending on patient populations and comorbidities. This arrhythmia not only prolongs hospitalization but also elevates the risk of thromboembolic events and cardiovascular mortality.[9]

Despite the established link between respiratory conditions and cardiovascular complications,[10] there is a notable gap in the literature regarding the specific incidence of AF in patients presenting with acute respiratory emergencies and exacerbations of chronic lung diseases.

Most studies focus on the general cardiovascular complications associated with respiratory infections or chronic lung diseases without specifically addressing the occurrence of AF.[11] The present study aimed to address these gaps by providing a comprehensive analysis of the incidence of AF in patients with acute respiratory emergencies and chronic lung disease exacerbations in Sulaimanyah City.

2. METHODS AND MATERIALS

Study design and setting

This observational cross-sectional study was conducted to assess the incidence of atrial fibrillation (AF) in patients presenting with acute respiratory emergencies and exacerbations of chronic lung diseases. The study was carried out over a 12-month period, from 1stMarch 2024 to 28th February 2025, at Shar Teaching Hospital in Sulaimaniyah City, Kurdistan Region, Iraq.

Participants

Participants were recruited through convenience sampling, a non-probability method chosen for its practicality in acute clinical settings. All patients presenting with acute respiratory emergencies or exacerbations of chronic lung diseases during the study period were screened for eligibility. Research assistants reviewed admission logs daily to identify potential candidates. Eligible individuals or their first-degree relatives (in cases of incapacitation) were approached within 24 hours of admission, provided with study information, and invited to participate. Finally, data from 100 participants meeting eligibility criteria were enrolled in the present study and ultimately analyzed.

Inclusion criteria comprised: (1) adults aged ≥18 years, (2) admission to Shar Teaching Hospital with a primary diagnosis of acute respiratory emergency or chronic lung disease exacerbation, and (3) willingness to provide informed consent (directly or via a proxy). Exclusion criteria were: (1) age <18 years, (2) normal oxygen saturation (SpO_2 ≥95% on room air), (3) terminal illness with life expectancy <48 hours, and (4) prior history of diagnosed AF to avoid confounding pre-existing conditions.

Data collection

Data collection followed a standardized protocol. At admission, participants underwent a 12-lead electrocardiogram (ECG) (MAC 5500 HD) system to detect AF. Clinical parameters, including oxygen saturation (measured via Masimo SET® pulse oximetry), inflammatory markers C reactive protein, were recorded. Demographic information, medical history, and outcomes (e.g., hospital length of stay, mortality) were extracted from electronic health records. For incapacitated patients, first-degree relatives provided consent, and data were collected retrospectively.

Ethical Considerations

Ethical approval was obtained from the Kurdistan Higher Council of Medical Specialties Research Ethics Committee (Ref: ABC). Written informed consent was secured from participants or proxies after explaining the study's purpose, risks, and benefits. Participants retained the right to withdraw without affecting their clinical care.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0. Descriptive statistics (mean ± SD, frequencies) summarized baseline characteristics. Chi-square tests compared categorical variables, while independent t-tests assessed differences in continuous variables. Binary logistic regression identified predictors of AF. A two-tailed $p<0.05$ was considered significant. Missing data were handled via listwise deletion.

3. RESULTS

A total of 100 patients (14 patients with AF and 86 with no AF) admitted with acute respiratory emergencies or exacerbations of chronic lung disease were included in the study (Figure 1).

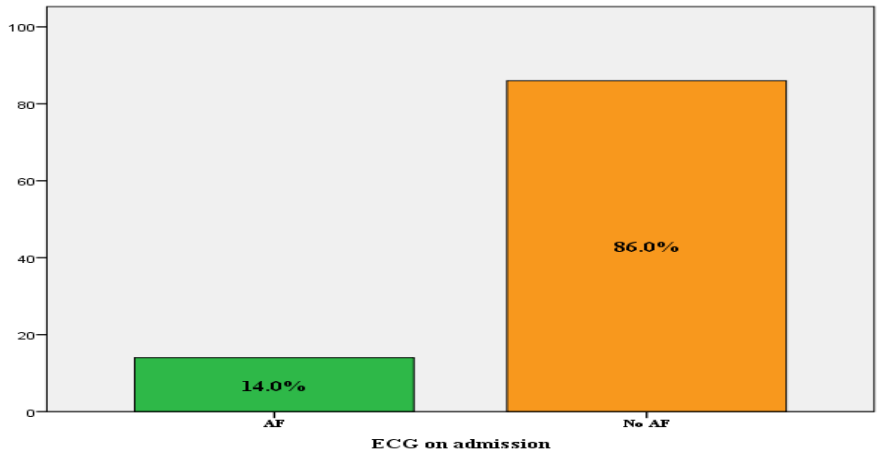

Figure (1): ECG on admission.

The mean age was 60.4 ± 14.3 years, with a median of 62 years, and the cohort comprised 58% females and 42% males. The majority of patients were mature adults (46–65 years, 45%) or elderly (≥66 years, 40%). Most patients resided in Sulaymaniyah city (53%), and the most common occupational exposure was among housewives (42%), reflecting significant indoor pollution exposure (Table 1).

Table (1): Association between patients' characteristics and atrial fibrillation (AF) on ECG admission.

Variable	Category	AF n (%)	No AF n (%)	Total n (%)	p-value
Age Group	19–45 (Early Adult)	1 (6.7)	14 (93.3)	15 (15.0)	0.579
	46–65 (Mature Adult)	6 (13.3)	39 (86.7)	45 (45.0)	
	≥66 (Elderly)	7 (17.5)	33 (82.5)	40 (40.0)	
Sex	Male	5 (11.9)	37 (88.1)	42 (42.0)	0.607
	Female	9 (15.5)	49 (84.5)	58 (58.0)	
Occupation	Building/Construction Worker	2 (13.3)	13 (86.7)	15 (15.0)	0.268
	Housewife (Indoor Pollution Exposure)	9 (21.4)	33 (78.6)	42 (42.0)	
	Agricultural Worker	1 (12.5)	7 (87.5)	8 (8.0)	
	Non-exposure	2 (5.7)	33 (94.3)	35 (35.0)	
Address	Sulaymaniyah	7 (13.2)	46 (86.8)	53 (53.0)	0.808
	Outside Sulaymaniyah	7 (14.9)	40 (85.1)	47 (47.0)	
Smoking	Yes	5 (17.9)	23 (82.1)	28 (28.0)	0.488
	No	9 (12.5)	63 (87.5)	72 (72.0)	
Packs/Year	Non-smoker	9 (12.5)	63 (87.5)	72 (72.0)	0.505
	Light (1–20 packs/year)	0 (0.0)	2 (100.0)	2 (2.0)	
	Moderate (21–40 packs/year)	2 (33.3)	4 (66.7)	6 (6.0)	
	Heavy (>40 packs/year)	3 (15.0)	17 (85.0)	20 (20.0)	

The most frequent indications for admission were acute exacerbations of COPD (25%), asthma (24%), and pneumonia (22%), followed by pulmonary fibrosis (15%) and bronchiectasis (5%) (Table 2). A history of chronic lung disease was present in

79% of patients, with COPD (25%) and asthma (24%) being the most prevalent. Notably, 21% had no prior chronic lung disease.

Table (2): Clinical diagnosis and Comorbidity

Variable	Category	Frequency (%)
Indication for admission	Acute Asthma Exacerbation	24 (24.0)
	Acute COPD Exacerbation	25 (25.0)
	Pulmonary Fibrosis Exacerbation	15 (15.0)
	Bronchiectasis Exacerbation	5 (5.0)
	Pneumonia	22 (22.0)
	Obstructive Sleep Apnea	7 (7.0)
	Pulmonary Embolism	2 (2.0)
History of chronic lung disease	COPD	25 (25.0)
	Asthma	24 (24.0)
	Pulmonary Fibrosis	15 (15.0)
	Bronchiectasis	5 (5.0)
	OSA	7 (7.0)
	Previous TB	2 (2.0)
	Squamous Cell Carcinoma	1 (1.0)
	None	21 (21.0)

Chest imaging revealed findings consistent with pneumonia in 26% and COPD in 23% of cases, while 21% had normal imaging (Table 3). Echocardiography was normal in 53% of patients; however, hypertensive heart disease (HHD) was observed in 29%, and pulmonary hypertension (PHTN) in 3%. Dilated right heart was present in 7% of cases.

Table (3): Imaging and Cardiac Function Findings.

Imaging / echo findings	Category	Frequency (%)
Chest imaging	Normal	21 (21.0)
	Findings suggest bronchiectasis.	5 (5.0)
	Findings suggest COPD.	23 (23.0)
	Findings suggest Asthma.	8 (8.0)
	Findings suggest Lung fibrosis.	15 (15.0)
	Findings suggest Pneumonia.	26 (26.0)
	Findings suggest Acute pulmonary embolism	2 (2.0)
Echocardiography	Normal EF & Echo	53 (53.0)
	Hypertensive Heart Disease (HHD)	29 (29.0)
	HHD + Pulmonary Hypertension (PHTN)	8 (8.0)
	Dilated Right Heart	7 (7.0)
	PHTN Only	3 (3.0)

Atrial fibrillation (AF) was detected on admission ECG in 14% of patients. The incidence of AF did not differ significantly by age group, gender, occupation, or address. However, AF was more frequently observed among patients admitted with acute exacerbations of COPD (20%) and those with obstructive sleep apnea (OSA, 42.9%), though these associations did not reach statistical significance (Table 4). Similarly, a history of COPD or OSA was associated with higher rates of AF, but without statistical significance.

Table (4): Association between clinical characteristics and atrial fibrillation (AF) on ECG admission.

Variable	Category	AF n (%)	No AF n (%)	Total n (%)	P-value
Indication of Admission	Acute Exacerbation of Asthma	3 (12.5)	21 (87.5)	24 (24.0)	0.209
	Acute Exacerbation of COPD	5 (20.0)	20 (80.0)	25 (25.0)	
	Acute Exacerbation of Pulmonary Fibrosis	2 (13.3)	13 (86.7)	15 (15.0)	
	Acute Exacerbation of Bronchiectasis	0 (0.0)	5 (100.0)	5 (5.0)	
	Pneumonia	1 (4.5)	21 (95.5)	22 (22.0)	
	Obstructive Sleep Apnea (OSA)	3 (42.9)	4 (57.1)	7 (7.0)	
	Pulmonary Embolism	0 (0.0)	2 (100.0)	2 (2.0)	
Chronic Lung Disease	None	1 (4.8)	20 (95.2)	21 (21.0)	0.296
	Asthma	3 (12.5)	21 (87.5)	24 (24.0)	
	COPD	5 (20.0)	20 (80.0)	25 (25.0)	
	Pulmonary Fibrosis	2 (13.3)	13 (86.7)	15 (15.0)	
	Bronchiectasis	0 (0.0)	5 (100.0)	5 (5.0)	
	Obstructive Sleep Apnea (OSA)	3 (42.9)	4 (57.1)	7 (7.0)	
	Squamous Cell Carcinoma	0 (0.0)	1 (100.0)	1 (1.0)	
	Previous Tuberculosis	0 (0.0)	2 (100.0)	2 (2.0)	
Chest Imaging Findings	Normal	2 (9.5)	19 (90.5)	21 (21.0)	0.734
	Findings suggest Bronchiectasis	0 (0.0)	5 (100.0)	5 (5.0)	
	Findings suggest COPD	5 (21.7)	18 (78.3)	23 (23.0)	
	Findings suggest Asthma	2 (25.0)	6 (75.0)	8 (8.0)	
	Findings suggest Lung Fibrosis	2 (13.3)	13 (86.7)	15 (15.0)	
	Findings suggest Pneumonia	3 (11.5)	23 (88.5)	26 (26.0)	
	Findings suggest Acute Pulmonary Embolism	0 (0.0)	2 (100.0)	2 (2.0)	
Echocardiography Findings	Normal EF	5 (9.4)	48 (90.6)	53 (53.0)	0.229
	HHD	7 (24.1)	22 (75.9)	29 (29.0)	

	PHTN	1 (33.3)	2 (66.7)	3 (3.0)	
	Dilated Right Heart	1 (14.3)	6 (85.7)	7 (7.0)	
	HHD and PHTN	0 (0.0)	8 (100.0)	8 (8.0)	

All patients had elevated CRP (≥5 mg/L), with a mean CRP of 50.9 ± 45.7 mg/L. Leukocytosis was present in 62% of patients, and 15% had anemia. The mean SpO_2 on admission was 86.9 ± 5.1%, improving to 93.7 ± 2.3% at discharge. Notably, patients with AF had significantly lower SpO_2 on admission (p=0.012) and higher CRP levels (p=0.001) compared to those without AF (Table 5).

Table (5): Clinical and laboratory parameters.

Parameter	Mean ± Sd	Median (IQR)	Min – max	Abnormal frequency (%)
Spo_2 on admission (%)	86.92 ± 5.10	88.0 (85.0 – 90.0)	70 – 93	–
Spo_2 on discharge (%)	93.66 ± 2.29	94.0 (93.0 – 95.0)	85 – 98	–
CRP (mg/l)	50.94 ± 45.66	38.30 (17.08 – 68.91)	7 – 218	100% ≥5
WBC ($\times 10^3$ cells/ml)	11.58 ± 3.48	11.25 (9.30 – 13.90)	4.00 – 21.20	62% High
Hemoglobin (g/dl)	13.16 ± 2.29	13.2 (11.83 – 14.90)	3.8 – 18.5	15% Low
Platelets ($\times 10^3$/ml)	280.98 ± 79.34	274.5 (225.5 – 344.25)	102 – 550	2% Low, 3% High

Regarding treatment, 41% of patients had no prior drug therapy, while 33% were on LABA+ICS inhalers. Use of β-blockers was rare (2%). AF was significantly more common among patients on β-blockers (p=0.012) and those requiring non-invasive ventilation (NIV) or long-term oxygen therapy (LTOT) (p=0.019). On discharge, AF had resolved in all but one patient, who died during hospitalization (p=0.013) (Table 6).

Table (6): Association between treatment-related variables and AF on ECG admission.

Variable	Category	AF n (%)	No AF n (%)	Total n (%)	p-value
Drug History	None	6 (14.6)	35 (85.4)	41 (41.0)	0.012
	LABA + ICS inhaler	4 (12.1)	29 (87.9)	33 (33.0)	
	SABA inhaler	0 (0.0)	8 (100.0)	8 (8.0)	
	β-blocker	2 (100.0)	0 (0.0)	2 (2.0)	
	LAMA (Tiotropium)	2 (18.2)	9 (81.8)	11 (11.0)	
	LABA + ICS + LAMA	0 (0.0)	5 (100.0)	5 (5.0)	
LTOT	Not on LTOT	10 (11.4)	78 (88.6)	88 (88.0)	0.019
	On LTOT	2 (22.2)	7 (77.8)	9 (9.0)	
	NIV on BiPAP	2 (66.7)	1 (33.3)	3 (3.0)	
ECG on Discharge	No AF	13 (13.1)	86 (86.9)	99 (99.0)	0.013
	Dead	1 (100.0)	0 (0.0)	1 (1.0)	

4. DISCUSSION

The current study identified a 14% incidence of atrial fibrillation (AF) among patients admitted with acute respiratory emergencies or exacerbations of chronic lung disease, with a notable association between AF and conditions such as COPD and obstructive sleep apnea (OSA), although these were not statistically significant. This incidence aligns closely with prior

research in similar clinical contexts. For example, Bernstein et al. (2022) reported an approximate 10% incidence of new-onset AF in patients hospitalized with COVID-19 pneumonia, which is somewhat lower but comparable to the present findings in non-COVID respiratory emergencies.[12] Similarly, Musikantow et al. (2021) found a 10% incidence of AF/AFL in COVID-19 inpatients and a 12% incidence in influenza patients, suggesting that acute respiratory infections broadly contribute to AF risk.[13]

The higher incidence of AF in COPD exacerbations observed in this study (20%) is consistent with established literature highlighting the strong link between COPD and cardiovascular disease, including arrhythmias. Bartlett-Pestell et al. (2025) emphasized that COPD exacerbations significantly increase the risk of AF, likely due to multifactorial mechanisms such as systemic inflammation, hypoxia, and increased sympathetic tone.[14] This is further supported by Hawkins et al. (2024), who demonstrated that COPD exacerbations elevate the risk of cardiovascular events, including arrhythmias, with risk persisting for up to a year post-exacerbation.[15]

Notably, patients with AF had significantly lower oxygen saturation and higher C-reactive protein (CRP) levels on admission, supporting the role of hypoxia and inflammation as potential triggers for AF in this population. These findings are in agreement with the work of Galea et al. (2014), who highlighted the impact of acute hypoxemic and inflammatory states on the development of AF in critically ill patients.[16] However, unlike some previous studies, we did not find a statistically significant association between AF and age,[17] sex,[18] or smoking status.[19] This discrepancy may be attributed to the relatively small sample size and the specific demographic characteristics of our cohort, which included a high proportion of females and housewives with significant indoor pollution exposure. Additionally, the resolution of AF in most patients by discharge suggests that AF in this context is often transient and related to the acute illness.

5. CONCLUSIONS

Atrial fibrillation occurred in 14% of patients admitted with acute respiratory emergencies or chronic lung disease exacerbations, most often in those with COPD or OSA and in patients with higher inflammation and lower oxygen levels. AF was usually transient, resolving by discharge in nearly all cases. These findings highlight the importance of monitoring for AF during acute respiratory illnesses, especially in high-risk patients.

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