A SURVEY OF SOME RISK FACTORS FOR ATRIAL FIBRILLATION IN PATIENTS WITH ARRHYTHMIA AT CHO RAY HOSPITAL

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ABSTRACT

Background: Atrial fibrillation (AF) is a common arrhythmia with serious complications. Identifying its risk factors is crucial for prevention and treatment. This study aimed to identify independent risk factors for AF in arrhythmia patients at Cho Ray Hospital. **Methods:** This descriptive cross-sectional study included 272 patients treated for arrhythmia between December 2023 and May 2024. Data on clinical history and paraclinical indicators were collected. The prevalence of AF was determined, and both univariate and multivariate logistic regression analyses were used to investigate the association between potential risk factors and AF. Statistical significance was set at a P-value <0.05. **Results:** The study found an AF prevalence of 14.7% in the patient group. Univariate analysis showed that age, heart failure, left atrial (LA) dimension, and estimated glomerular filtration rate (eGFR) were significantly associated with AF. However, a multivariate model identified only LA dimension and a history of diabetes as independent risk factors. For every one-millimeter increase in LA dimension, the risk of AF increased by 19.8% (OR=1.198, 95% CI: 1.093-1.313). Diabetic patients had a 3.4-fold higher risk of AF compared to non-diabetic individuals (OR=3.421, 95% CI: 1.021-11.466). **Conclusion:** The findings suggest that an enlarged LA and a history of diabetes are independent risk factors for AF in this patient population. These results provide an important basis for early screening and management to improve outcomes for arrhythmia patients

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I. BACKGROUND

Atrial fibrillation (AF) is one of the most common cardiac arrhythmias, especially in the elderly population. The condition can lead to serious complications such as stroke, heart failure, and an increased risk of mortality [1,3,7,8]. Therefore, identifying the risk factors for AF is crucial for its prevention and treatment.

Numerous studies worldwide and in Vietnam have indicated a relationship between AF and several cardiovascular and metabolic risk factors. Hypertension, dyslipidemia, and diabetes are common underlying conditions often found in patients with arrhythmias [6,7,8].

However, the independent association of each risk factor with AF in the specific population of arrhythmia patients, particularly at Cho Ray Hospital, needs to be further clarified. This study aims to identify independent risk factors for AF, including age, gender, medical history (hypertension, diabetes, heart failure), and paraclinical indicators (left atrial dimension, renal function, NT-proBNP).

The objectives of this study are:

- To determine the prevalence of AF in arrhythmia patients at Cho Ray Hospital.
- To investigate the relationship between risk factors (age, gender, underlying diseases like hypertension, diabetes, heart failure, and

paraclinical indicators) and the occurrence of AF.

- To analyze the statistically significant independent risk factors for AF in the study population.

Ultimately, this research is expected to provide additional scientific evidence to support clinicians in diagnosing, assessing risk, and making more effective treatment decisions for arrhythmia patients.

II. SUBJECTS AND METHODS

2.1 Participants

Patients with arrhythmias treated at the Department of Arrhythmia Treatment at Cho Ray Hospital from December 2023 to May 2024 were included in the study.

Inclusion criteria:

- Patients who are adults (≥ 18 years old).
- Patients diagnosed with and treated for arrhythmia at the Department of Arrhythmia Treatment at Cho Ray Hospital.
- Patients who consented to participate in the study.

Exclusion criteria:

- Severely ill patients at risk of death (e.g., those with severe acute conditions such as metabolic acidosis coma, liver failure, kidney failure, respiratory failure, or severe cardiovascular disease).
- Pregnant women.
- Patients with an indication for surgery.
- Patients with an estimated glomerular filtration rate (eGFR) ≤ 30 mL/min/1.73m².
- Patients who did not consent to participate.

2.2 Research Methods

Study Design: This was a descriptive cross-sectional study.

Sample Size and Selection: The sample size was estimated from a previous study to be a minimum of 207 patients, and a consecutive sampling method was used.

Data Collection: Information on age, gender, BMI, medical history, liver function tests, kidney function tests, dyslipidemia, echocardiogram results, and ECG were collected from patient medical records and clinical examinations.

Atrial Fibrillation (AF) Diagnosis: AF diagnosis was based on the 2020 European Society of Cardiology (ESC) guidelines. According to the guidelines, documented evidence of AF on an electrocardiogram is necessary for diagnosis. A 12-lead ECG or single-lead ECG recording lasting ≥ 30 seconds showing a heart rhythm without clear, repeating P waves and with an irregularly irregular RR interval (when atrioventricular conduction is not impaired) is sufficient for a clinical diagnosis of AF [4].

2.3 Data Processing and Analysis

Data were analyzed using R statistical software version 4.3.1. For quantitative variables, data with a normal distribution were expressed as mean and standard deviation (M ± SD), while non-normally distributed data were expressed as median and interquartile range (Median [IQR]). Qualitative variables were presented as percentages (%). Statistical significance was defined as a P-value < 0.05. Logistic regression was used to test for associated factors, using odds ratios (OR) and 95% confidence intervals (CI).

2.4 Ethical Considerations

The study received approval from the Biomedical Research Ethics Council of the University of Medicine and Pharmacy at Ho Chi Minh City, with approval number 806/HĐĐĐ-ĐHYD dated September 22, 2023.

III. RESULTS

The study collected data from 285 patients, which included 244 patients without AF and 41 patients with AF. Of the 244 patients without AF, 12 had an eGFR < 30 mL/min/1.73m². Among the 41 AF patients, one had an eGFR < 30 mL/min/1.73m². The final number of patients eligible for the study was 272, comprising 232 patients without AF and 40 patients with AF. The prevalence of AF in this group of arrhythmia patients was 14.7%.

3.1 Clinical Characteristics of Study Subjects

Table 1: ***General characteristics of the 272 study subjects***

	Total (n=272)	**Male (n=149)**	**Female (n=123)**
	Median (IQR)	Median (IQR)	Median (IQR)
Age (years)	68 (55-76)	64 (51-74)	71 (59.5-77.5)
Height (m)	1.6 (1.55-1.65)	1.65 (1.60-1.66)	1.55 (1.50-1.57)
Weight (kg)	58 (50-65)	61 (55-67)	53 (48-60)
BMI (kg/m²)	22.5 (20.6-24.1)	23.1 (20.9-24.2)	21.9 (20.0-23.4)
Systolic BP (mmHg)	130 (120-140)	120 (120-140)	130 (120-140)
Diastolic BP (mmHg)	74.5 (70-80)	70 (70-80)	80 (70-80)

Comments: The median age of the entire cohort is 68 years, with a notable difference between genders: females are older with a median age of 71 years compared to males at 64 years. Males are, on average, taller and heavier than females, as reflected in their median height (1.65 m vs. 1.55 m) and weight (61 kg vs. 53 kg). Although males are heavier, the median BMI is slightly higher for males (23.1 kg/m²) than for females (21.9 kg/m²). Both genders have similar systolic blood pressure, while females show a slightly higher median diastolic blood pressure.

3.2. Medical History and Cardiovascular Risk Factors

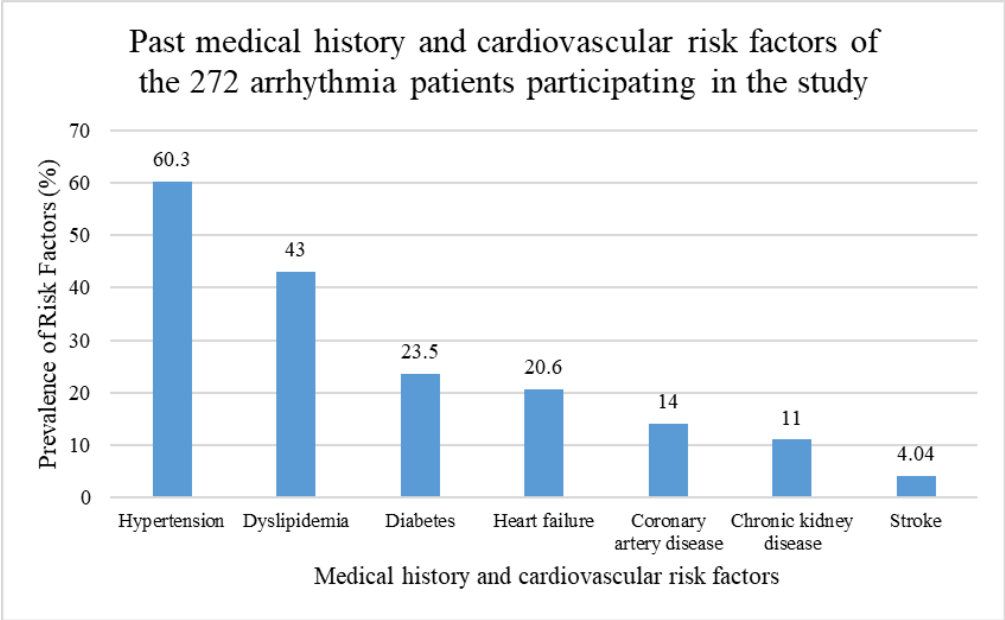

Chart 1: ***Past medical history and cardiovascular risk factors of the 272 arrhythmia patients participating in the study***

Comments: The chart indicates that the majority of the patients in the study had a history of various cardiovascular and metabolic diseases, especially hypertension, dyslipidemia, diabetes, and heart failure. Hypertension was the most common risk factor, with the highest prevalence at 60.3%. Dyslipidemia was the second most common, at 43.0%. Diabetes and heart failure were also significant risk factors, accounting for approximately 23.5% and 20.6% respectively. Other conditions such as coronary artery disease (14.0%), chronic kidney disease (11.0%), and stroke (4.04%) were less prevalent but still present.

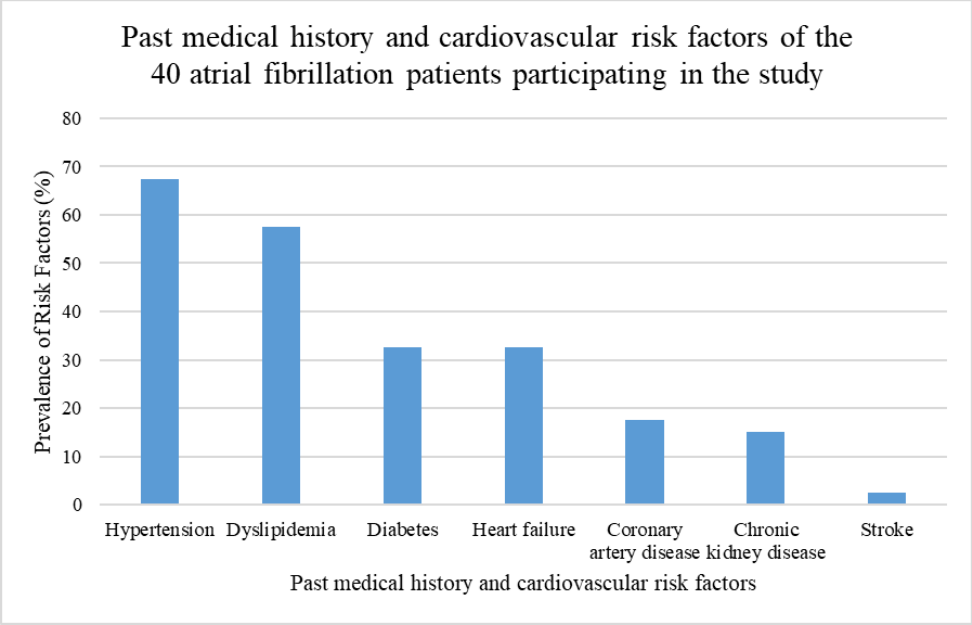

Chart 2: ***Past medical history and cardiovascular risk factors of the 40 atrial fibrillation patients participating in the study.***

Comments: The majority of atrial fibrillation patients in this study group had a history of other cardiovascular and metabolic diseases, especially hypertension and dyslipidemia. The prevalence of these risk factors was similar to that observed in the overall patient group.

Table 2: ***Symptoms on admission of the study subjects (n=272)***

Symptom	Frequency (n)	Percentage (%)
Syncope	165	60.6
Dizziness	153	56.2
Dyspnea	58	21.3
Palpitations	40	14.7
Fatigue	37	13.6
Chest pain	28	10.2
Chest heaviness	11	4.04
Lightheadedness	11	4.04
Weakness	8	2.94
Others (e.g., dysphagia, hand tremors, slow and difficult speech, abdominal pain, vomiting, hiccups, leg swelling, shortness of breath, numbness in limbs, pacemaker battery depletion)	16	5.88

Comments: Syncope and dizziness were the two most common symptoms in the study group. Syncope had the highest frequency with 165 cases (60.6%), followed by dizziness with 153 cases (56.2%). Dyspnea (21.3%) and palpitations (14.7%) were the next most frequent symptoms. Fatigue was also common, appearing in 13.6% of patients, often alongside other symptoms. Chest pain (10.2%), chest heaviness (4.04%), lightheadedness (4.04%), and weakness (2.94%) had lower frequencies but are still important signs to note. Other less common symptoms accounted for a small percentage (5.88%).

Table 3: ***Symptoms on admission of AF patients (n=40)***

Symptom	Frequency (n)	Percentage (%)
Syncope	26	65.0
Dizziness	24	60.0
Palpitations	8	20.0
Dyspnea	7	17.5
Fatigue	5	12.5
Chest pain	1	2.50
Chest heaviness	1	2.50
Lightheadedness	1	2.50
Weakness	1	2.50

Comments: Syncope and dizziness were the most common symptoms, with rates of 65.0% and 60.0%, respectively. Palpitations (20.0%) and dyspnea (17.5%) were the next most common symptoms. Fatigue also accounted for a significant percentage (12.5%), often accompanying the symptoms above. Symptoms like chest pain, chest heaviness, lightheadedness, and weakness had a much lower frequency, each accounting for only 2.5%.

3.3 Laboratory and Paraclinical

Table 4: ***Some laboratory indices of the study group***

	Total (n=272)	Non-AF (n=232)	AF (n=40)
	Median (IQR)	Median (IQR)	Median (IQR)
HGB (g/L)	128 (116-138)	128 (116-138)	129 (114-138)
HCT (%)	38.5 (35.1-41.3)	38.5 (35.2-41.1)	38.1 (34.2-41.7)
WBC (G/L)	8.00 (6.67-10.0)	8.20 (6.75-10.2)	7.35 (6.35-8.48)
PLT (G/L)	189 (136-231)	192 (138-241)	157 (128-208)
INR	1.05 (1.01-1.13)	1.04 (1.01-1.11)	1.14 (1.04-1.35)
Creatinine (mg/dL)	0.88 (0.76-1.07)	0.87 (0.75-1.03)	0.94 (0.80-1.19)
eGFR (mL/min/1.73m²)	81.4 (63.2-94.0)	83.9 (64.3-96.7)	71.2 (57.5-84.2)
Free T4 (pg/mL)	12.3 (11.2-13.8)	12.3 (11.0-13.4)	13.6 (12.0-14.7)
TSH (mIU/L)	1.41 (0.79-2.23)	1.41 (0.80-2.23)	1.42 (0.77-2.19)
Cholesterol (mg/dL)	157 (129-190)	163 (133-191)	131 (112-167)
HDL-Cholesterol (mg/dL)	42 (35-49)	41 (35-49)	43 (38-48)
LDL-Cholesterol (mg/dL)	92 (67-122)	96 (72-124)	67.5 (58-100)
Triglyceride (mg/dL)	132 (93-189)	136 (94-187)	125 (90-198)
hs-TnI (pg/mL)	18.1 (4.67-99.3)	16.1 (4.54-90.0)	23.1 (10.8-135)
NT-proBNP (pmol/L)	44.1 (10.2-163)	34.5 (7.2-157)	108 (57.7-291)

Comments: The majority of the median values for laboratory indices were within normal limits, with only the median eGFR being < 90 mL/min/1.73m².

Table 5: ***Echocardiogram indices of the study subjects***

	Total (n=272)	Non-AF (n=232)	AF (n=40)
LA (mm)	32 (28-38)	31 (28-35)	41 (37-44)
EF (%)	65 (56-71)	65 (57-71)	61 (49-69)
EDV (mL)	102 (84-129)	102 (85-129)	106 (85-166)
ESV (mL)	36 (27-53)	36 (28-51)	36 (27-94)
LVEDD (mm)	47 (43-52)	47 (44-52)	45 (42-57)
LVESD (mm)	30 (27-35)	30 (27-34)	30 (27-41)

Note: *LA: Left Atrium dimension; EF: Ejection Fraction; EDV: End-Diastolic Volume; ESV: End-Systolic Volume; LVEDD: Left Ventricular End-Diastolic Diameter; LVESD: Left Ventricular End-Systolic Diameter.*

Comments: The median left atrial (LA) dimension in the AF patient group was 41 mm, which was larger than the 31 mm median in the non-AF group ($p < 0.001$, Wilcoxon rank sum test). The median ejection fraction (EF) in both groups was within the normal range. There were no significant differences in end-systolic volume (ESV), end-diastolic volume (EDV), left ventricular end-systolic diameter (LVESD), or left ventricular end-diastolic diameter (LVEDD) between the two groups.

3.4 Risk Factors Associated with Atrial Fibrillation

Table 6: ***Univariate logistic regression analysis of risk factors associated with atrial fibrillation***

Variable	OR	95% CI	P (Wald's test)
Age	1.03	1.01-1.06	0.02
Gender (Male)	1.45	0.73-2.89	0.29
Hypertension	0.67	0.31-1.44	0.307
Diabetes	1.77	0.85-3.70	0.126
Heart failure	2.12	1.01-4.44	0.047
LA	1.15	1.08-1.24	< 0.001
eGFR	0.98	0.97-0.99	0.013
NT-proBNP	1.2002	0.9997-1.0007	0.501
Hs TnI	1	0.9998-1.0003	0.824

Comments: The analysis table shows that age, heart failure, left atrial dimension, and renal function are statistically significant risk factors for atrial fibrillation in this study group. Of these, the left atrial dimension (LA) showed the strongest association.

Statistically significant factors:

- Age: The OR for age was 1.03, with a 95% CI of 1.01 to 1.06 and p=0.02. This indicates a strong association between age and the risk of AF. Specifically, for every one-year increase in age, the likelihood of developing AF increases by 3%.
- Heart failure: The OR for heart failure was 2.12, with a 95% CI of 1.01 to 4.44 and p=0.047. This suggests that patients with heart failure have a 2.12 times higher risk of developing AF compared to those without heart failure.
- Left atrial dimension (LA): The OR for LA was 1.15, with a 95% CI of 1.08 to 1.24 and $p < 0.001$. This was the factor with the strongest association with AF in the table. For every one-unit increase in the left atrial

dimension, the risk of AF increases by 15%.

• Renal function (eGFR): The OR for eGFR was 0.98, with a 95% CI of 0.97 to 0.99 and p=0.013. This indicates an inverse relationship between eGFR and the risk of AF. As eGFR decreases, the risk of AF increases.

Non-statistically significant factors:

• Gender, hypertension, diabetes, NT-proBNP, and Hs TnI were not statistically significant in their association with AF, as their p-values were greater than 0.05.

• The 95% confidence intervals for these factors (excluding NT-proBNP and Hs TnI) all contained the value 1.0, indicating no statistically significant difference. This does not mean these factors are unrelated to AF, but rather that the relationship was not strong enough to be statistically significant in this specific sample.

Table 7: ***Multivariate logistic regression analysis of risk factors associated with atrial fibrillation***

Variable	OR	95% CI	P
Intercept	0.30	0.00 - 0.51	0.27
Age	0.989	0.943 - 1.037	0.65
Gender (Male)	1.493	0.445 - 5.006	0.516
Hypertension	0.535	0.146 - 1.960	0.345
Diabetes	3.421	1.021 - 11.466	0.047
Heart failure	2.355	0.649 - 8.544	0.193
LA	1.198	1.093 - 1.313	< 0.001
eGFR	0.975	0.944 - 1.006	0.118
NT-proBNP	0.999	0.998 - 1.0001	0.093
TnI	1	0.9993 - 1.0005	0.821

Comments: The analysis table shows that left atrial dimension (LA) and diabetes are the two main independent and statistically significant risk factors for atrial fibrillation in this model. Other factors such as age, gender, hypertension, heart failure, eGFR, NT-proBNP, and TnI did not demonstrate a statistically significant independent association.

Statistically significant factors:

• Left atrial dimension (LA): This was the factor with the strongest and most statistically significant association with AF ($p < 0.001$). With an OR = 1.198 (95% CI: 1.093 - 1.313), this indicates that for every one-unit increase in the left atrial dimension, the risk of developing AF increases by approximately 19.8%.

• Diabetes: Diabetes was a statistically significant independent risk factor ($p = 0.047$), although at a marginal level. With an OR = 3.421 (95% CI: 1.021 - 11.466), this suggests that diabetic patients have a 3.4 times higher risk of AF compared to non-diabetic individuals.

Non-statistically significant factors:

• Age, gender, hypertension, heart failure, eGFR, NT-proBNP, and TnI were not statistically significant in this model, with p-values greater than 0.05 and their 95% confidence intervals containing the value 1.

• NT-proBNP ($p = 0.093$): Although it did not reach the threshold for statistical significance, its p-value was close to 0.05, suggesting a possible trend of association.

IV. DISCUSSION

This study was conducted with the aim of surveying some risk factors for atrial fibrillation in arrhythmia patients at Cho Ray Hospital. The main findings show that the prevalence of AF among this group of arrhythmia patients was 14.7%. Multivariate logistic regression analysis identified two independent and statistically significant risk factors for AF: LA dimension and diabetes. Specifically, each one-millimeter increase in LA dimension raised the risk of AF by 19.8%, and diabetic patients had a 3.4 times higher risk of AF compared to non-diabetic individuals.

The finding regarding the association between left atrial dimension and AF in this study is consistent with published medical literature. An enlarged left atrium is a sign of cardiac remodeling, a pathological process that increases the risk of developing AF. This confirms that LA dimension is a valuable clinical indicator for predicting AF risk.

However, the results for other factors showed some differences. In the univariate analysis, age and heart failure had a statistically significant association with AF. This is consistent with many international studies, where advanced age and heart failure are considered leading risk factors for AF. Yet, when included in the multivariate regression model, they were no longer statistically significant. This could be explained by the interaction among factors. For instance, advanced age often coexists with diabetes and heart failure, and diabetes and cardiac remodeling (reflected by LA dimension) are the true independent factors in this model. Similarly, hypertension, while a known common risk factor, did not show a statistically significant independent association in this study.

Notably, the result on the relationship between diabetes and AF is compelling. Although diabetes was not statistically significant in the univariate analysis, it became an independent risk factor in the multivariate analysis. This finding emphasizes the crucial role of diabetes in the pathogenesis of AF, possibly through complex mechanisms such as inflammation, myocardial fibrosis, and autonomic dysfunction.

The study's results suggest that although many risk factors may coexist in a patient, only a few play an independent role in promoting the development of AF [2,5]. Left atrial enlargement and remodeling (measured by LA dimension) are direct evidence of structural changes in the heart, which reduce contractility and create a favorable environment for re-entrant circuits that cause AF.

Furthermore, the role of diabetes as an independent risk factor, even when other factors are controlled for, highlights the importance of managing this metabolic condition in cardiovascular patients. Diabetes causes microvascular damage and cellular-level structural changes that can increase the vulnerability of the atria to AF. This reinforces the view that strict glycemic control is important not only for preventing microvascular and macrovascular complications but also for preventing arrhythmic events [4,6,7].

This study provides practical evidence on AF risk factors in a specific patient population in Vietnam. The results show that AF risk assessment should focus on independent and significant factors like left atrial dimension and a history of diabetes, in addition to other common factors. This has important clinical implications, helping physicians identify high-risk patients early to

establish appropriate monitoring and intervention strategies, thereby improving treatment outcomes and reducing the burden of disease.

The study acknowledges certain limitations. Its descriptive cross-sectional design cannot establish a causal relationship between risk factors and AF. The small sample size (n=272) compared to larger cohort studies, especially with only 40 AF patients, may reduce the statistical power and explain why some factors, such as age and heart failure, were not statistically significant in the multivariate model, despite being well-documented in the literature. Data was collected only from medical records and clinical examinations, which may lack other crucial information such as disease duration, level of disease control, or lifestyle variables.

V. CONCLUSION

The study identified left atrial dimension and diabetes as two independent risk factors for atrial fibrillation in arrhythmia patients at Cho Ray Hospital. This finding provides an important basis for the early screening and management of high-risk patients, thereby minimizing complications and improving prognosis. Further research with a cohort design and a larger sample size is needed to confirm and further clarify the causal relationship of these risk factors.

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