



Prevalence of atrial fibrillation in Thai elderly

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Atrial fibrillation (AF) is an important health problem due to its association with serious complications.^[1] Stroke is one of the most serious complications and is the leading cause of death and disabilities in this population. AF increases the risk of embolic stroke five times compared to general population.^[2] The prevalence of AF varies from 0.5%–15% depending on studied populations such as age, gender, as well as geographic.^[3–5] Aging is an important factor for the AF pathophysiology,^[6,7] and the prevalence of AF increases with age. The prevalence of AF in elderly aged more than 65 years was 7.2%,^[8] while the incidence of AF in octogenarians has been reported of 20.7/1000 population per year.^[9, 10]

Age is the strong predictor of stroke in patients with non-valvular AF. Therefore, it has been recommended that elderly patients with non-valvular AF (age > 65 years) should receive long-term oral anticoagulation.^[11,12] As a result, systematic or opportunistic screening increased AF detection as well as opportunity to start thromboembolic prophylaxis.^[13,14] However, the cost effectiveness for screening depends on the prevalence of AF.^[14] In Thailand, the prevalence of AF has been surveyed in a large scale study during 1998–1999 with a prevalence of 3.6 per thousand in population of 30 years or older.^[15] Nevertheless, the prevalence of AF in elderly Thai population is unknown. Therefore, this survey was conducted to determine the prevalence of AF in elderly Thai population.

Maerim is one of the largest district of Chiang Mai which is the metropolitan city situated in the northern part of Thailand. The city has a land area of 443.6 km² with a population of 84,433. Among these, 10,805 subjects were 65 years or older. There are 14 primary health care centers and one tertiary health care center in Maerim. This study is a

cross-sectional epidemiological survey. All subjects with 65 years of age or older who had been living in Maerim District, Chiang Mai were eligible to enter the study. The sample size was estimated based on the previous report of AF prevalence of 7.2%,^[8] and 1172 subjects were needed to achieve 80% of power and margin of error of 0.5. Due to a invitation survey, we estimated the loss due to design effect by 20% and a response rate of 80%. Therefore, the invitations were sent to 1547 subjects.

The subjects were sampled using multistage randomization. First, we divided the area into three clusters according to the distance to the tertiary healthcare center. Second, we sampled subjects by proportion to size of each cluster. Finally, we sampled subjects for each selected cluster by age. After sampling, field workers were assigned to publicize and invite sampling subjects to enter the study. If the sampling subjects declined the invitation, the field workers would invite the subjects who were listed in previous or next to them. ECG was performed by field workers. 12-leads ECG was printed and sent to two electro-physiologists for AF and atrial flutter diagnosis. Primary outcome was the prevalence of AF. Secondary outcome was prevalence of undiagnosed AF and antithrombotic use in subjects with known AF.

The continuous data were presented as mean ± SD and compared between groups using Student *t*-test or Mann-Whitney *U* test where appropriate. Categorical data were presented as *n* (%) and compared between groups using Fischer's exact test. A two-sided test was performed to indicate the statistical significance at the *P* < 0.05. All analyses were performed using SPSS software version 17.0 (SPSS Inc, Chicago, IL, USA).

A total of 1,277 subjects participated in this study with the mean age 73.1 ± 6.4 years and female 46.4%. AF was found in 24 subjects with the prevalence of 1.9% (95% CI: 1.12%–2.48%). The prevalence of AF increased with age

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which ranged from 1.5%, 2.2% and 2.8% in age group 65–74 years, 75–84 years and 85 years or older, respectively. The prevalence of AF was numerically but not significantly higher in population proximity to the tertiary health care center than the intermediate and far group (2.6% vs. 1.3% vs. 1.8%; $P = 0.39$).

The clinical characteristics of patients with and without AF were presented in Table 1. Patients with AF were significantly older (75.4 ± 6.5 years vs. 73.1 ± 6.4 years), had higher prevalence of heart failure (20.8% vs. 0.1%), ischemic heart disease (16.7% vs. 1.1%), valvular heart disease (29.2% vs. 0.1%), chronic obstructive pulmonary disease (16.7% vs. 2.6%), hyperthyroidism (8.3% vs. 0.9%) and prior stroke (16.7% vs. 0.8%), all P -value < 0.05 . The prevalence of hypertension and diabetes were not different between groups.

Among 24 AF patients, 17 subjects (70.8%) had been diagnosed previously. Echocardiogram was performed in 18 subjects (75%). Rheumatic heart disease and ischemic cardiomyopathy were found in 4 (16.6%) and 1 (4.1%) of them. Eleven patients (61.1%) had no significant structural heart diseases. Six subjects did not receive echocardiogram due to logistic problem. Three of them had known valvular heart diseases.

Regarding thromboembolic risk among 17 non-valvular AF subjects, 3 (17.6 %) experienced episodes of stroke or

transient ischemic attack. Mean CHA₂DS₂-VASc in subjects with non-valvular AF was 3.4 ± 1.2 (range 1–5). Most non-valvular AF subjects (16 in 17, 94.1%) had CHA₂DS₂-VASc ≥ 2 , which is indicated for oral anticoagulation. Seven (41.2%) did not receive thromboembolic prophylaxis and all of them were undiagnosed AF subjects. Among 10 subjects with known non-valvular AF, 4 (40%) subjects, 5 (50%) subjects and 1 (10%) subjects received warfarin, aspirin and dual antiplatelets therapy (DAPT, combination of aspirin and clopidogrel), respectively.

Due to the high morbidity and mortality associated with AF, diagnosis and appropriate thromboembolic prophylaxis are essential. In order to consider systematic screening or opportunistic screening for AF, the burden of AF in community should be determined. Our study was a first epidemiological study of AF prevalence in the Thai elderly. The prevalence of AF in Thai population aged more than 65 years was 1.9%, which tend to be higher in older population. One-third of AF population was undiagnosed AF. Among non-valvular AF, 94.1% had CHA₂DS₂-VASc ≥ 2 but only 23.5% received oral anticoagulants (OAC).

The prevalence of AF varied among previous reports. The discrepancies may have contributed by the differences in study populations, the method of AF detection or the nature of survey. The previous Rotterdam's study and SAFE study showed the prevalence of AF of 8.1% and 6.5% in population 65 years or older.^[19,16] Contrary, the survey from Korean and Japan showed the prevalence of 2.1% in patients age 65 years or older and 1.63% in patients age 60 years or older, respectively.^[17,18] In addition to age, there are other several factors predicting incident AF including race (white), height, weight, systolic blood pressure, diabetes, history of myocardial infarction and heart failure.^[19,20] These factors may contribute to the lower prevalence of AF in Asian who has lower prevalence of obesity, hypertension, coronary artery disease and heart failure.

AF detection methods have significant difference in sensitivity of AF detection. Longer period of monitoring or repeated ECG increases sensitivity for AF detection.^[21–23] Our study used single snapshot 12 leads ECG for AF detection which could miss a diagnosis of paroxysmal AF. The SAFE and Rotterdam study also used the 12 leads ECG. Intermittent ECG recording can improve AF detection in a systematic screening and has been shown to be cost-effectiveness in population age 75 years or older.^[13,24] In addition, teaching a population at risk to learn pulse palpation for self-detection of AF has been shown to be feasible and effective.^[25]

Patients with AF are at risk for thromboembolic events and antithrombotics should be given according to risk. In

Table 1. Demographic data of sampling subjects.

	Total (<i>n</i> = 1277)	Patients with AF (<i>n</i> = 24)	Patients without AF (<i>n</i> = 1253)	<i>P</i> value
Age, yrs	73.2 ± 6.4	75.4 ± 6.5	73.1 ± 6.4	0.09
65–74 yrs	783 (61.3%)	12 (50%)	771 (61.5%)	0.29
≥ 75 yrs	494 (38.7%)	12 (50%)	482 (38.5%)	
Male	544 (42.6%)	11 (45.8)	533 (42.5)	0.84
BMI, kg/m ²	21.8 ± 4.1	20.6 ± 2.9	21.8 ± 4.1	0.16
Hypertension	616 (48.2%)	13 (54.2%)	603 (48.1%)	0.68
Diabetes mellitus	147 (11.5%)	2 (8.3%)	145 (11.6%)	1.0
Heart failure	6 (0.47%)	5 (20.8%)	1 (0.1%)	< 0.001
Valvular heart disease	16 (1.3%)	7 (29.2%)	8 (0.1%)	< 0.001
Ischemic heart disease	18 (1.4%)	4 (16.7%)	14 (1.1%)	< 0.001
Thyroid disease	13 (1.0%)	2 (8.3%)	11 (0.9%)	0.02
Chronic kidney disease	12 (0.9%)	0	12 (1.0%)	1.0
COPD	36 (2.8%)	4 (16.7%)	32 (2.6%)	0.004
Prior stroke	14 (1.1%)	4 (16.7%)	10 (0.8%)	< 0.001
Smoking (current)	729 (58.2%)	10 (41.7%)	79 (57.9%)	0.14
Alcohol drinking (current)	783 (61.3%)	15 (62.5%)	768 (61.3%)	0.28

Data are presented as mean ± SD or *n* (%). AF: atrial fibrillation; BMI: body mass index; COPD: chronic obstructive pulmonary disease.

non-valvular AF, OAC is recommended in patients with $CHA_2DS_2-VASc \geq 2$ and should be considered in patients with $CHA_2DS_2-VASc = 1$. Every AF subject in our survey had CHA_2DS_2-VASc at least 1 and 94.1% had $CHA_2DS_2-VASc \geq 2$ which was indicated for OAC. However, only 40% of known AF subjects received warfarin while 60% received aspirin or DAPT. Even though, warfarin has been shown to be superior to aspirin or DAPT while aspirin is not superior to placebo for thromboembolic prophylaxis,^[26] warfarin is still underused.^[27,28] Physician related factors, patient related factors as well as health care system related factors can influence decision of antithrombotic used.^[27] These barriers should be addressed to improve anticoagulant use.

There are some limitations in this study. First, this study was a survey by invitation. Subjects who accepted for the invitation were likely to be health concern. Patients who had complications from AF or had co-morbidities may not be presented per invitation. However, the response rate was high (82.5%) and patients with documented AF or even on treatment also participated. Second, the diagnosis of AF in this study was based only on single random ECG record, therefore paroxysmal AF could have been under-diagnosed during the survey. As a result, our reported prevalence of AF may have been underestimated. Third, our survey had small sample size. Although the sample size was calculated based on previous prevalence, the low prevalence in our survey may contribute to the limited power to detect the true prevalence in our survey.

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