Prevalence of Cardiac Arrhythmias in Thai Community

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Abstract

The resting 12 leads electrocardiogram was recorded in 3,822 men and 4,969 women (aged 30 years or over), who participated in the First National Health Examination Survey of Thailand and the data was used to determine the prevalence of cardiac arrhythmias. In this apparently normal population 362 subjects (the standard age adjusted rate was 39.2 per thousand) had cardiac arrhythmia. The prevalence rate of atrial fibrillation was 3.6 per thousand (males 3.6, females 3.6) and ventricular premature beat was 12.1 per thousand (males 7.3, females 15.6). For atrial premature beat, complete and incomplete right bundle branch blocks, sinus arrhythmia, first degree atrioventricular block and delta wave, the prevalence rates were 4.0, 7.0, 4.6, 2.7, 2.4 and 1.3 per thousand respectively. Complete and incomplete left branch blocks, left anterior hemiblock, second degree antrioventricular block and short PR interval were rare in this survey.

Key word : Arrhythmia, Electrocardiogram, Prevalence, Community, Thailand

In general, the view of normality of the cardiac rhythm is based on electrocardiogram (ECG) taken at the medical examination of healthy people. Although, an electrocardiogram allows inspection of 6 complexes from 3-12 leads or less than a hundred heart beats in all, the usefulness of the ECG is readily evident in a clinical setting. Since a high percentage of hospital and clinic populations have underlying cardiovascular diseases, particularly those admitted into the cardiac service, they are pre-selected and biased populations. As a result, the arrhythmia will have greater specificity in reference to diagnosis and prognosis due to their close association with clinical events. Also, the prevalence of

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arrhythmias based on these populations may not be appropriate for generalization of the population in the community.

From 1991 to 1992 the first Thai National Health Examination Survey was carried out with the collaboration of many health organizations (see Acknowledgment) and coordinated by the National Epidemiology Board of Thailand. This report is a subsection of the survey. The objective of this study was to describe the prevalence of cardiac arrhythmia in apparently healthy subjects in a Thai community.

MATERIAL AND METHOD

Population

Data were collected by the multistage random sampling of the total population of Thailand in the year 1991 (August-December), using the sampling frame of the National Statistical Office of Thailand. A household was used as a sampling unit. All family members aged 30 or above were included into the study.

Electrocardiograms

Standard supine 12-lead ECG were recorded using ECG equipment fulfilling the recommendations of the American Heart Association for technical specifications[1].

All ECG records (25 mm/second) were mounted. These records were screened by medical residents for the following abnormal rhythm and conduction: atrial fibrillation (AF); atrial flutter; atrial and ventricular premature contraction (APC& VPC); sinus arrest; sinus arrhythmia (SA); sino-atrial block (SAB); first, second and third degree atrio-ventricular blocks (1°, 2° & 3° AVB); supra-ventricular tachycardia; right and left bundle branch blocks (RBBB & LBBB); left anterior (QRS axis -40° to 90°) and posterior (QRS axis + 105° to + 180°) hemifasicular blocks; short PR interval and delta wave. The screened records with arrhythmia were confirmed and coded by three cardiologists. Each cardiologist was asked to interpret the poor quality records as well as possible. The uncodable ECGs were adjudicated by consensus agreement. If two types of arrhythmias co-existed, each of them was separately coded. The codes of all ECG records were separately entered twice into a computer by one assistant and the results compared. The arrhythmia criteria was based on the standard ECG criteria[2]. Any isolated premature beat detected on the mounted ECG was coded, regardless of the percentage of the recorded beats as premature.

Statistics

Descriptive statistics were applied for rates. Age standardization was performed using the standard population of Thailand in the mid-year of 1990[3]. Chi-square as well as Fisher's exact probability statistics were applied where appropriate. All p values were two sided, and the level of significance was 95 per cent.

RESULTS

Among the 17 surveyed provinces, there were 5,881 households and 23,884 family members. Eight thousand seven hundred and ninety one were 30 years or older (43.4 per cent were male). All subjects had 12-lead surface electrocardiogram recorded. The population distribution by age groups and sex is shown in Table 1. There was a total of 362 cardiac arrhythmias noted and the standardized age-adjusted prevalence rate was 39.2/1,000. The standardized age- and sex-adjusted prevalence rate of each type of cardiac arrhythmias was calculated in terms of rate per thousand (Table 2, 3).

The four relatively common arrhythmias found in this study were as follows:

1. VPCs ranked as the most common arrhythmia found in this study. The standard age adjusted rate was 12.1 /1,000. It increased with age ($p<0.05$) especially in subjects who were older than 45 years old. Surprisingly, VPCs occurring in females was almost double the rate found in males ($P < 0.05$) (Table 3).

2. CRBBB prevalence rate was 7.0/1,000, while the incomplete RBBB rate was 4.6/1,000. The CRBBB was significantly more common in the older population and more common in males than females ($p<0.015$), while incomplete RBBB was significantly more common in males ($p<0.001$) but was not related to age. CLBBB and incomplete LBBB were uncommon in this study as would have been expected in the general population and the prevalence rates were 0.1/1,000 and 0.4/1,000 respectively. Left anterior hemiblock was detected in four subjects with the prevalence rate of 0.4/1,000.

3. APCs was the third most common arrhythmia which was equally distributed among both sexes, but occurred more common in elderly subjects ($p=0.00$).The prevalence rate was 4.0/1,000.

Table 1. Age-sex distribution of the study population.

Age group	Number of Persons		Total	Per cent
	Male	Female		
30-34	651	900	1,551	17.6
35-44	1,165	1,531	2,696	30.7
45-54	867	1,048	1,915	21.8
55-64	676	854	1,530	17.4
65-74	337	439	776	8.8
≥ 75	126	197	323	3.7
Total	3,822	4,969	8,791	100.0

Table 2. Standardized age-adjusted prevalence rate of cardiac arrhythmias-rates/1,000.**

Diagnosis	Age (n)						Total	Rate	standard age-adjusted*
	30-34	35-44	45-54	55-64	65-74	>75			
AF *	0.7 (1)	1.8 (5)	5.7 (11)	6.5 (10)	5.1 (4)	9.3 (3)	34	3.9	3.6
APC*	1.9 (3)	2.6 (7)	1.0 (2)	5.2 (8)	15.5 (12)	18.6 (6)	38	4.3	4.0
VPC*	5.1 (8)	8.9 (24)	16.2 (31)	11.8 (18)	25.8 (20)	30.9 (10)	111	12.6	12.1
CLBBB	0.0	0.0	0.0	0.0	1.3 (1)	0.0	1	0.1	0.1
CRBBB*	1.9 (3)	5.2 (14)	4.7 (9)	11.1 (17)	18.0 (14)	30.9 (10)	67	7.6	7.0
ICLBBB	0.0	0.4 (1)	0.5 (1)	0.6 (1)	1.3 (1)	0.0	4	0.4	0.4
ICRBBB	4.5 (7)	4.4 (12)	5.2 (10)	4.6 (7)	6.4 (5)	0.0	41	4.7	4.6
LAH	0.0	0.4 (1)	1.0 (2)	0.0	0.0	3.1 (1)	4	0.4	0.4
SA*	5.1 (8)	1.8 (5)	2.6 (5)	0.0	3.9 (3)	3.1 (1)	22	2.5	2.7
1(AVB*	0.0	3.0 (8)	1.6 (3)	3.3 (5)	5.1 (4)	9.3 (3)	23	2.6	2.4
2(AVB Type I	0.7 (1)	0.0	0.0	0.0	0.0	0.0	1	0.1	0.1
Short PR interval	0.0	0.0	0.5 (1)	2.0 (3)	0.0	0.0	4	0.4	0.4
Delta wave	0.0	2.2 (6)	2.1 (4)	0.6 (1)	1.3 (1)	0.0	12	1.4	1.3

Abbreviations: AF = atrial fibrillation, APC=atrial premature contraction, VPC = ventricular premature contraction ,
CLBBB & ICLBBB =complete and incomplete left bundle branch blocks,
CRBBB & ICRBBB = complete and incomplete right bundle branch blocks, LAH = left anterior hemiblock
SA =sinus arrhythmia, 1°& 2°AVB = first and second degree atrio-ventricular blocks.
* = $p<0.05$ comparison across age groups
** = Numbers in parentheses are number of subjects

4. AF prevalence rate was 3.6/1,000. The prevalence increased with age ($p=0.013$); and it was insignificantly prominent among men ($p = 0.94$) (Table 3).

Other less common arrhythmias included: 1°AVB was detected in 2.4/1,000, while 2°AVB was found in only one subject (0.1/1,000), it was 2° (AVB, Mobitz type I. The prevalence rates of sinus arrhythmias, short PR interval and delta wave (typifying Wolff-Parkinson-White syndrome) were 2.7/1,000, 0.4/1,000 and 1.3/1,000 respectively. The sinus arrhythmia occurred more often in younger age groups and appeared to decrease with age ($p= 0.044$). While the presence of the delta wave had no relation with age, it was statistically more common in males ($p<0.005$). The presence of short PR segment had no relation with either age or sex.

DISCUSSION

There were two electrocardiographic surveys reported in Thailand before this study. One was done in children and hospital based, which is

Table 3. Unadjusted and adjusted prevalence rates of cardiac arrhythmia in male and female-rates/1,000.

Diagnosis	Male			Female		
	N (3822)	Rate	Age adjusted	N (4969)	Rate	Age adjusted
AF	15	3.9	3.6	19	3.8	3.6
APC	19	5.0	4.4	19	3.8	3.6
VPC*	32	8.4	7.3	79	15.9	15.6
CLBBB	1	0.3	0.2	0	0	0
CRBBB*	3.9	10.2	9.2	28	5.6	5.3
ICLBBB	2	0.5	0.5	2	0.4	0.4
ICRBBB*	30	7.8	8.2	11	2.2	2.1
LAH*	4	1.0	1.0	0	0	0
SA	8	2.1	2.2	14	2.8	3.0
1(AVB*	16	4.2	4.0	7	1.4	1.2
2(AVB(type I)	1	0.3	0.3	0	0	0
Short PR interval	2	0.5	0.4	2	0.4	0.3
delta wave*	10	2.6	2.6	2	0.4	0.4

* $P < 0.05$ for sex comparison

not comparable with this report[4]. Another study was done in 1978, Hatthirat et al[5] studied 2,008 normal Thais of both sexes, aged 15 years or older. They were screened by cardiologists taking medical history and physical examination as normal before having an ECG done. The sampled population was from eight representative districts (two from each of the four regions of the country). These were people who volunteered for health screening done by a research team at a particular health center. In comparison with our study results, the prevalence rates of AF (0.5 *vs* 3.6/1,000), delta wave (WPW) (0.5 *vs* 1.3/1,000) were lower while those of VPCs (25 *vs* 12.1/1,000), SA (41 *vs* 2.67/1,000), 1° AVB (35 *vs* 2.4/1,000) and 2° AVB (1 *vs* 0.1/1,000) were higher in Hatthirat's study. APCs rate was equally found in both studies. The bundle branch blocks were not reported in Hatthirat's report.

The reasons for having a much higher rate of sinus arrhythmia and lower AF rate in Hatthirat's report may be due to the higher proportion of younger age groups (thirty-five per cent of those subjects were younger than 30 years old), and fewer aged population (>54 years old), as these arrhythmias are significantly correlated with age. AF was not uncommon in Thai community. The prevalence was higher than reported in the previous studies[5-7]. Camm et al[8] reported that, in active elderly subjects, AF, as detected by 24 hours ambulatory electrocardiographic monitoring, was a common arrhythmia occurrence in 10 per cent of subjects who were 75 years of age or over. However, AF was not detected in 98 healthy elderly subjects in the study of Fleg et al[7]. Although the incidence of AF in men was insignificantly higher than in women in the Framingham study[9] and men had a significantly higher rate of AF than women in the aging population[10], the difference between sexes was not shown in our study.

Atrial flutter was not detected in this report. Therefore, it is a rare finding in the Thai community.

The VPCs rate was almost twice as high in the previous report in Thais[5] compared to ours. Because the prevalence of VPCs was closely related to the method that was used to detect them and the population that was studied. The recording time frame is one of the main factors, ambulatory ECG detected higher arrhythmic rates than the routinely 12 leads ECG record as had been shown in studies in the active elderly subjects[7,8]. As the incidence of the observed prematurities increases with age, the difference in age distribution will result in reports which have a different prevalence rates as seen in many studies including the studies in Thai populations[5-6,8]. VPCs also occur in association with a variety of stimuli and medical conditions, they can also be provoked by a variety of conditions such as tension states, excessive use of tobacco, caffeine, or alcohol. These factors could cause a variation in

rates of VPCs among different studies. Despite considering all possible related factors, we still cannot explain the high prevalence of VPCs among the relatively younger Thai population in the previous report compared to our study. However, Hiss et al[6] reported the prevalence of VPCs among 122,043 healthy male subjects, with comparable population age groups with Hatthirat's report[5] (most of them were <50 years of age). The reported prevalence rate was 7.8/1,000, which was also much lower than that reported by Hatthirat.

The unexpected predominantly high VPCs rate in females in our report is very interesting (Table 3). This was different from the previous studies done in 50 normal young men and 50 young women, using 24 hour continuous ECG recording[10,11] which showed no differences between men and women with respect to VPCs frequency and complexity. Nevertheless there are some studies, both in Thai and other populations, which illustrated the insignificant higher rate in females[5,13]. The studies done at the University of Illinois[13] evaluated cardiac rhythm in 50 normal younger men and women (age 23 to 28 year old) using 24-hour continuous ECG recordings showed some insignificant higher rate of VPCs in women. The difference was prominent when considering the rate of detecting more than 50 VPCs/24 hours. This may suggest that women tend to have more VPCs than men. In our study, premature beats were coded when one isolated or more ectopics occurred on one mounted 12 leads ECG, which was contradictory to that suggested in the Minnesota code where the coded premature beats must occur in as many as 10 per cent or more of the recorded complexes[14]. Therefore, the more sensitive coding criteria used in our study, which allowed us to detect more isolated VPCs, may be another reason for having higher VPCs in women.

Atrial premature contractions could be found in all different age groups and appeared to significantly increase with age. The data from the previous studies[7,8] revealed that, in elderly subjects, atrial premature contractions was noted in 21-100 per cent.

The prevalence of premature contractions (including atrial and ventricular) was highly dependent on the technique that was used to evaluate. In this study, examined electrocardiograms provided only a limited time frame for evaluation. With the advent of 24 hour ambulatory ECG monitoring, a better evaluation of the prevalence of premature contractions can be obtained.

RBBB was noted in all different age groups and seemed to increase with age in this study ($p< 0.05$). In Hiss report[6], there was no significant difference in the incidence rate between the age groups, and it was concluded that RBBB may occur in the absence of underlying cardiac disease. However, the data from the Reykjiavik Study[15] showed that the prevalence of RBBB increased with age and was significantly related to hypertension, elevated fasting blood sugar and increased heart size.

The apparent rarity of LBBB in this study points out that it is not a common finding in the Thai community. Evaluation of cases presenting with LBBB in the previous study[6] frequently showed evidence of underlying cardiac disease including; artherosclerotic heart disease, rheumatic fever and other disease processes.

First degree AVB rate was very low in our study, one of the possible explanations is that it may be secondary to the fixed PR interval criteria used in our study, while in Hatthirat's study[5] the heart rate dependent PR interval criteria was used instead. Advanced AVB and complete heart block were rare in this study. Only one male subject had second degree atrioventricular block type I.

The prevalence of delta wave (WPW) varies from 0.1-3.0/1,000 in apparently healthy subjects, with the average of about 1.5/1,000[16]. Our finding of this abnormality among the Thai population with the rate of 1.3/1,000, is comparable.

SUMMARY

This is the first report of the prevalence of cardiac arrhythmias in the Thai community recorded by using the resting 12 lead ECG method. Electrocardiograms on 8,791 apparently healthy subjects in a Thai community aged 30 years and older recorded in this study and 362 subjects (39.2 per thousand) had cardiac arrhythmia. The age standardized prevalence rate was reported in terms of rate per thousand.

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ความชุกของภาวะหัวใจเต้นผิดจังหวะของประชาชนไทยในชนบท

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ผลของการสำรวจคลื่นไฟฟ้าหัวใจในประชากร อายุ 30 ปีขึ้นไป ในการสำรวจสถานะสุขภาพอนามัยของประชาชนไทย จำนวน 8,791 ราย เป็นชาย 3,822 ราย หญิง 4,969 ราย พบภาวะหัวใจเต้นผิดจังหวะ จำนวน 392 ราย (39.2 ต่อ 1,000)

ความชุกของภาวะหัวใจเต้นผิดจังหวะต่อประชากร 1,000 คน มีดังนี้ atrial fibrillation 3.6, ventricular premature contraction 12.1, atrial premature contraction 4.0, complete right bundle branch block 7.0, incomplete right bundle branch block 4.6, sinus arrhythmias 2.7, first degree atrioventricular block 2.4 และ delta wave 1.3 จากการสำรวจนี้ภาวะหัวใจเต้นผิดจังหวะชนิด complete และ incomplete left bundle branch block, left anterior hemiblock, second degree atrioventricular block และ short PR interval พบได้น้อยมาก

คำสำคัญ : ภาวะหัวใจเต้นผิดจังหวะ, คลื่นไฟฟ้าหัวใจ, ความชุก, ชนบทไทย

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