The Prevalence of Left Ventricular Hypertrophy and Associated Factors in a Thai Population

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Abstract

Electrocardiographic left ventricular hypertrophy (LVH) has been a bad prognostic factor for cardiovascular morbidity and mortality. However the prevalence and prognostic value of LVH are varied among nationalities and populations. Several factors have been shown to associate with LVH. Some factors are treatable such as hypertension. We prospectively studied the prevalence of LVH and associated factors in selected group of Thai population. The study population was 1,606 Shinawatra employees who were 30 year old or more. The prevalence of LVH was 13 per cent (210) among study population. Hypertension, lower body weight and male sex were significantly associated factors. In the subjects with LVH, the prevalence of hypertension was 25.6 per cent, male ratio was 5:1 and mean body weight was 57.7 kg. compare to 9.8 per cent prevalence of hypertension, 2:1 female ratio and mean body weight was 62.3 kg in the group without LVH.

Key word : Left Ventricular Hypertrophy, Associated Factors, Prevalence

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Recently, cardiovascular mortality has been the leading cause of death in Thailand. The socioeconomic burden of cardiovascular mortality and morbidity would have a major impact on the society. Understanding of risk factors are necessary for effective and preventive plans. Identifying the high risk population may lead to the most cost effective utilization of the limited resources.

The electrocardiographic finding of left ventricular hypertrophy was shown to correlate with an increased cardiovascular morbidity and mortality(1). In some studies, the increased mortality rate and risk of overt coronary artery disease were found independent of the effect of hypertension (2). In a prospective study of conventional risk factors of coronary artery disease in Shinawatra employees, we studied the prevalence and associated factors of electrocardiographic left ventricular hypertrophy. The follow-up information may help the society focus the preventive plans to the high risk group and maximize utilization of our resources.

MATERIAL AND METHOD

In a 5 year prospective study of conventional risk factors of coronary artery disease in Shinawatra employees, twelve lead electrocardiogram was performed in the people who were ≥30 years old, using Hewlett Packard M1700A. The electrocardiograms were automatically interpreted by the computer and reconfirmed by cardiologists. The left ventricular hypertrophy was diagnosed on the basis of the point score system proposed by Romhilt and Estes(3).

The blood pressures were measured with a mercury sphygmomanometer, at least twice, by medical personnel. Each measurement was done after ≥5 minutes resting and to the nearest 2 mmHg. The average was used for statistical analysis. The third measurement was done if the first two measurements differed by more than 10 mmHg. The average of the closest two was used for analysis if the blood pressure was measured three times. The correlation coefficients between the two measurements of systolic and diastolic blood pressure were 0.94 and 0.89 respectively.

Weight was measured with undergarments by medical personnel, using a standard balanced scale to the nearest 200 grams. Height was measured in bare feet, back square against the scale. Waist and hip circumference measurements were done with the Ohaus spring scale exerting the force of 750 grams.

Waist circumference was measured over a lightly-clothed abdomen at the smallest diameter between the costal margin and the iliac crest. Hip circumference was measured over light clothing at the level of the greater trochanters.

The statistical analysis was performed using student's *t*-test, chi square test and binary logistic regression analysis.

RESULTS

From 3,615 study population, there were 1,606 persons who are ≥ 30 year old and had electrocardiogram done. This population was different than the younger group in many ways. They had higher body weight, body mass index, waist and hip circumference, blood pressure and prevalence of hypertension as shown in Table 1.

Table 1. Characteristics of the study presons age < 30 and ≥ 30 year old.

	Persons ≥30 year old (n = 1,606)	Persons <30 year old (n = 2,009)	p-value
Age (yr)	32.2 ± 5.3	26.6 ± 3.1	<0.001
Sex (male)	678 (42.2%)	572 (28.5%)	<0.001
Weight (kg)	58.4 ± 12.1	53.8 ± 10.6	<0.001
Height (cm)	161 ± 8.0	159.9 ± 8.0	<0.001
BMI (kg/m^2)	22.2 ± 3.5	20.9 ± 3.2	<0.001
Waist (cm)	72.1 ± 10.8	67.3 ± 9.1	<0.001
Hip (cm)	91.4 ± 7.3	89.1 ± 6.9	<0.001
BP (mmHg)	116/77 ± 14/10	111/74 ± 11/8	<0.001
Pulse pressure	38 ± 8	37 ± 8	<0.001
Hypertension	11.9%	3.8%	<0.001

Table 2. Characteristics of the study presons with and without electrocardiographic left ventricular hypertrophy.

	Persons with LVH (n = 210)	Persons without LVH (n = 1,396)	p-value
Age (yr)	34.5 ± 5.5	34.1 ± 5.2	0.34
Sex (male)	177 (84.3%)	501 (35.9%)	<0.001
Weight (kg)	62.3 ± 11.1	57.7 ± 12.1	<0.001
Height (cm)	166.3 ± 6.5	160.8 ± 8.0	<0.001
BMI (kg/m^2)	22.4 ± 3.2	22.2 ± 3.6	0.44
Waist (cm)	76.3 ± 9.9	71.5 ± 10.8	<0.001
Hip (cm)	92.6 ± 6.5	91.2 ± 7.4	0.011
SBP (mmHg)	121 ± 14	115 ± 13	<0.001
DBP (mmHg)	81±11	77±10	<0.001
Pulse pressure	40 ± 8	38 ± 8	0.005
Hypertension	53(25.6%)	137(9.8%)	<0.001

Electrocardiographic left ventricular hypertrophy was found in 210 (13%) subjects. In univariate analysis, the subjects with LVH had significantly higher male proportion (84.3% *vs* 35.9%) and prevalence of hypertension (25.6% *vs* 9.8%), but lower body weight (57.7±12.1 kg *vs* 62.3±11.1 kg) and waist circumference (71.5±10.8 cm *vs* 76.3±9.9 cm) than those without LVH as shown in Table 2.

In multivariate analysis, LVH was associated with male sex and hypertension as shown in Table 3.

DISCUSSION

In this study, the persons ≥30 year old tended to have more unhealthy prognostic factors occurred in cluster. This raised the question of interrelation among these risk factors which need careful consideration in planning the preventive strategies for cardiovascular morbidity and morality.

Various investigations can detect left ventricular hypertrophy with different sensitivity and specificity[4]. The prognostic value of eletrocardiographic LVH was shown to be independent of echocardiographic LVH and the increase cardiac shadow on chest roentgenogram[5]. Electrocardiogram may not be the most sensitive investigation for left ventricular hypertrophy, the cost, the availability and simplicity of the ECG would make it be the most appropriate test for the large study population.

Table 3. Associated factors with LVH by multivariate analysis.

	Odds ratio	95% CI	p-value
Sex (male)	12	6.9-21	<0.0001
Weight	0.92	0.89-0.97	0.0006
Hypertension	2.6	1.4-4.6	0.001

Recently, obesity, pulse pressure and excessive hypertension on exercise had been brought up as the important risk factors for cardiovascular morbidity and mortality[6-8]. However in our study population, we did not find significant correlation between electrocardiographic LVH and pulse pressure. This in part may be from the population selection since the prevalence of isolated systolic hypertension is in general higher in the older people[9]. The association between electrocardiographic LVH and lower body weight may reflect the limitation of the ECG. The thickness of the chest wall may effect the QRS amplitude and interfere with the sensitivity of the test. We did not have information in labile hypertension. The blood pressures in our study were measured after resting.

Limitation

The study was performed in selected population which had unique characteristics.

SUMMARY

In the authors' 1,606 study population, electrocardiographic left ventricular hypertrophy was found in 13 per cent and associated with hypertension, male sex, lower body weight. The significantly

higher prevalence of hypertension, blood pressure, body mass index, waist and hip circumference were also found in this population compare to the younger group.

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