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Research article

Integrating coronary artery calcium scores into primary prevention for acute coronary syndrome in patients with noncommunicable disease: A system development approach in Phetchabun Hospital

Santichai Sripanitan
Department of Internal Medicine, Phetchabun Hospital

*Corresponding author, e-mail: santihitman@gmail.com

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Abstract
Background: Acute coronary syndrome (ACS) is a major public health issue and a leading cause of death in Thailand. Primary prevention, holistic management, and secondary prevention play vital roles in its management. **Objective:** This study aimed to identify systemic issues in ACS primary prevention in Phetchabun Hospital and examine the impact of a new holistic, multidisciplinary paradigm approach for ACS primary prevention. **Methods:** This research and development study included patients being treated for noncommunicable disease (NCD) at Phetchabun Hospital. The patients' coronary artery calcium scores (CACSs) were compared between the ACS and non-ACS groups. Treatment outcomes before and after the implementation of the holistic integration approach were also compared. **Results:** Of the 171 patients with NCD, 55% were treated with an inappropriate level of statins (75.3% undertreated and the rest overtreated) based on their 10-year atherosclerotic cardiovascular disease risk score. The average CACS was significantly higher in the ACS group (417.50; interquartile range [IQR]: 147.25–688.27) than in the non-ACS group (0; IQR: 0–27.90, $p < 0.001$). In addition, the holistic approach significantly reduced total cholesterol (200.16 ± 53.22 vs. 148.26 ± 38.53, $p < 0.001$), low-density lipoprotein cholesterol (127.48 ± 43.28 vs. 77.70 ± 32.24, $p < 0.001$), fasting blood glucose (130.38 ± 56.48 vs. 115.78 ± 50.45, $p = 0.022$), and body weight (67.12 ± 12.60 vs. 66.03 ± 11.73, $p = 0.01$). **Conclusion:** Over half of the patients with NCD received suboptimal management. CACS effectively helped distinguish ACS from non-ACS cases. A multidisciplinary, holistic approach significantly improved primary prevention outcomes for patients with NCD.

Keywords: acute coronary syndrome, coronary artery calcium score, primary prevention

Introduction

Acute coronary syndrome (ACS) is a major public health issue and a leading cause of death in Thailand.[1] According to the Central Chest Institute of Thailand, as many as 26,726 patients were diagnosed as having ACS from October 1, 2019, to September 30, 2020. Despite considerable advancements in ACS treatment, its incidence continues to rise. This is also seen in Thailand's Phetchabun Province, resulting in elevated cardiovascular mortality. A major underlying issue is inadequate primary prevention in patients with noncommunicable diseases, including those with hypertension, diabetes mellitus, and dyslipidemia.[2]

At Phetchabun Hospital, approaches to disease prevention vary considerably among individual physicians due to the absence of clear practice guidelines. This highlights problems in the primary prevention system, including inadequate and ineffective screening, assessment, and risk classification. Consequently, ACS prevention strategies have not reached desirable efficacy, as evidenced by the increasing annual incidence. Thus, prevention is clearly more important than treatment.

These systemic issues underscore the need for a new, effective primary prevention system. This study developed such a system by including the use of the coronary artery calcium score (CACS), which is strongly related to coronary artery disease,[3-6] to enhance the efficacy of the primary prevention system in Phetchabun Hospital.

Objectives

This research and development study was divided into three phases:

Phase 1: This phase focused on understanding the systemic issues with the primary prevention of ACS and identifying the problems with its effectiveness. It involved patients with noncommunicable diseases who were undergoing treatment in the outpatient department of the Division of Internal Medicine, Phetchabun Hospital.

Phase 2: This phase involved analyzing the problems identified in Phase 1 with the intention of improving the primary prevention of ACS and, accordingly, developing a new screening system, reclassifying patients according to individual risk groups, and providing appropriate prevention methods for each individual's risk. Moreover, this phase compared the CACSs of patients with and without ACS to improve the precision of distinguishing individuals experiencing cardiac chest pain from those with other causes.

Phase 3: This phase assessed the newly developed paradigm for primary prevention by comparing treatment outcomes before and after system development.

Benefits obtained from the study

1. Awareness of the systemic problems in the primary prevention of ACS in Phetchabun Province.

2. Development of a new, more effective primary prevention system for ACS.

3. Identification and management of the risk factors for ACS as well as provision of appropriate treatment and prevention.

4. Characterization of the incidence of CACS in patients with ACS compared with the general population in Phetchabun Province.

Definitions

Acute coronary syndrome (ACS): A group of symptoms caused by the loss of blood supply to the heart muscle.

ACS group: A group of participants diagnosed as having acute coronary syndrome.

Appropriate statin: The prescription of statin intensity as determined using each individual's atherosclerotic cardiovascular disease (ASCVD) risk score.

Coronary artery calcium score (CACS): The identification of calcified plaque in the coronary artery wall using a CT scan.

Inappropriate statin: The prescription of statin intensity not based on the individual's ASCVD risk score.

Lipid-lowering agent: A statin group that includes simvastatin, atorvastatin, and pravastatin.

Non-ACS group: This group consisted of participants who had not been diagnosed as having acute coronary syndrome.

Noncommunicable disease (NCD): Chronic diseases, including diabetes mellitus, hypertension, dyslipidemia, and smoking.

Non-ST-segment elevation myocardial infarction (NSTEMI): A subgroup of acute coronary syndromes that do not exhibit ST-segment elevation on an electrocardiogram.

Statin overtreatment: prescription of statin at higher dosages than recommended by the individual ASCVD risk score.

Primary prevention: Preventing a disease from ever occurring.

ST-segment elevation myocardial infarction (STEMI): Acute coronary syndrome characterized by ST-segment elevation on an electrocardiogram.

Statin undertreatment: The prescription of statin at lower dosages than indicated by individual ASCVD risk scores.

Literature Review

ACS is a group of conditions in which the blood supply to the heart is suddenly reduced or stopped, leading to damage to or death of the heart muscle. It includes ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI).[7, 8] The most common pathomechanism of STEMI is plaque rupture, whereas that of NSTEMI is typically plaque erosion.[7, 9] The risk factors for ACS include(10) modifiable risk factors, such as smoking, hypertension, diabetes mellitus, dyslipidemia, alcohol consumption, obesity, and lack of physical activity, as well as nonmodifiable risk factors, such as age and sex. Inflammation, particularly evidenced by elevated levels of inflammatory markers such as C-reactive protein, has been identified as an additional risk factor for ACS.[11] The most common manifestations of ACS include chest pain, acute heart failure, and cardiogenic shock.[12] However, atypical manifestations frequently lead to delays in diagnosis.[13] ACS is diagnosed based on the Fourth Universal Definition of Myocardial Infarction (2018)[9] and is typically treated with medications such as antianginal drugs, especially beta-blockers,[14-16] antiplatelets,[14, 16, 17] reperfusion therapy(16) for STEMI, and secondary prevention.[16-21]

Coronary artery calcium score (CACS) is a measure for detecting calcified plaques in the coronary artery wall on computed tomography (CT) scans. CACS is strongly associated with atherosclerosis.[5] It is used to predict major cardiovascular outcomes, especially in asymptomatic patients. The most widely used quantification method for CACS is the Agatston method, with calcium volume and relative calcium mass score also being commonly used.[5] On the basis of the Agatston Score, coronary artery calcification is classified as[6] no (score of 0), mild (1–99), moderate (100–399), severe (400–999), and extensive (≥1,000). Vascular calcification[5] can be due to various factors, such as aging, inflammation, hyperlipidemia, and hyperglycemia. Many studies have confirmed that CACS is strongly associated with coronary artery disease. For example, the 2011 Heinz Nixdorf Recall (HNR) study(6) by Mahabadi et al. reported that using CACS for predicting major cardiovascular events was not only better than using traditional risk factors, especially in intermediate-risk patients, but also enhanced risk group classification, thereby enabling more appropriate treatment. Detrano et al. used data from the Multi-Ethnic Study of Atherosclerosis (MESA) cohort[3] and demonstrated that using CACS improved not only the prediction of major cardiovascular events but also stratification for cardiovascular risk groups, with no difference in four ethnic groups; approximately 12% of their cohort were Asian, and their results corresponded to those of the HNR study. Other studies, such as that by Elias-Smale et al.[4], have found that the CACS resulted in better cardiovascular risk stratification, especially in intermediate-risk patients from the Framingham risk score, where CACS > 615 was reclassified as high risk and CACS < 50 was reclassified as low risk. The Coronary Artery Risk Development in Young Adults (CARSIA) study by Okwuosa et al.[22] evaluated the relationship between coronary artery calcium and Framingham risk score and found that screening with coronary artery calcium may be beneficial in groups with a Framingham risk score > 10%. The 2019 ESC/EAS guidelines for the management of dyslipidemias[19] recommend the use of CACS for cardiovascular risk stratification in asymptomatic patients with low to intermediate risk.[19, 23-25]

Methods

Study design

This study employed a research and development approach.

Population

This research was conducted in three phases.

Phase 1 was a retrospective study including patients with a noncommunicable disease being treated in the Department of Internal Medicine, Phetchabun Hospital, from January 1, 2021, to December 31, 2021. The sample size (n) was calculated using the following formula (https://www.calculator.net/):

$z2 \times p \times (1 - p)/e^2$

where $z = 1.96$ for a confidence level (α) of 95%, p = proportion (expressed as a decimal), and e = margin of error.

$z = 1.96$, $p = 0.5$, $e = 0.075$

$n = 1.962 \times 0.5 \times (1 - 0.5)/0.0752$

$n = 0.9604/0.0056 = 170.738$

$n \approx 171$

Thus, approximately 171 patients were included in this phase. The inclusion criteria were patients (1) aged over 18 years old and (2) being treated for a noncommunicable disease at the Department of Internal Medicine, Phetchabun Hospital. Patients who had a history of ACS, whose information could not be retrieved from the hospital registry, or who had previously undergone percutaneous coronary intervention with stenting were excluded.

Phase 2 compared the CACSs of patients with and without ACS (ACS and non-ACS groups, respectively) who were being treated at the Department of Internal Medicine, Phetchabun Hospital. The sample size was 65. CACS was determined using noncontrast transaxial CT of the heart during inspiration. A dual-source CT scanner was used (SOMATOM FORCE, Siemens Medical Solution, Forchheim, Germany) with a high-pitch spiral technique (120 kVp, pitch 3.4, collimation 128 × 0.6 mm) and radiation optimization (using CARE Dose). The CACS was determined by a single analyst (T.S.) using the Syngo.via application (Siemens Medical Solution).

For the non-ACS group, the inclusion criteria were patients (1) aged over 18 years old and (2) being treated for a noncommunicable disease at the Department of Internal Medicine, Phetchabun Hospital. The exclusion criteria were (1) a history of ACS, (2) unavailable information in the hospital registry, (3) a history of percutaneous coronary intervention with stenting, (4) a history of diagnosis of peripheral artery disease, and (5) refusal to participate in the study.

For the ACS group, the inclusion criteria were patients (1) aged over 18 years old; (2) being treated for ACS at the Department of Internal Medicine, Phetchabun Hospital or referred to the department for further investigation or treatment of ACS; and (3) having been newly diagnosed as having ACS by clinical, electrocardiogram, and laboratory testing at the department. Patients (1) who declined in-hospital treatment, (2) whose information could not be retrieved from the hospital registry, or (3) who required emergency transfer to another hospital were excluded.

Phase 3 compared the patients' treatment outcomes before and after the implementation of the new paradigm and multidisciplinary team approach for the primary prevention of ACS. This approach includes lifestyle modification education with a multidisciplinary team, the utilization of the CACS to reclassify cardiovascular risk and to provide guidance for the most appropriate statin treatment based on the risk of each individual, and close follow-up with a cardiologist. Fifty patients were included. Inclusion criteria were (1) patients aged over 18 years old and (2) those who had already participated in the phase 2 study or had volunteered to participate in the study. The exclusion criteria were (1) a history of ACS, (2) unavailable information in the hospital registry, and (3) refusal to participate in the study.

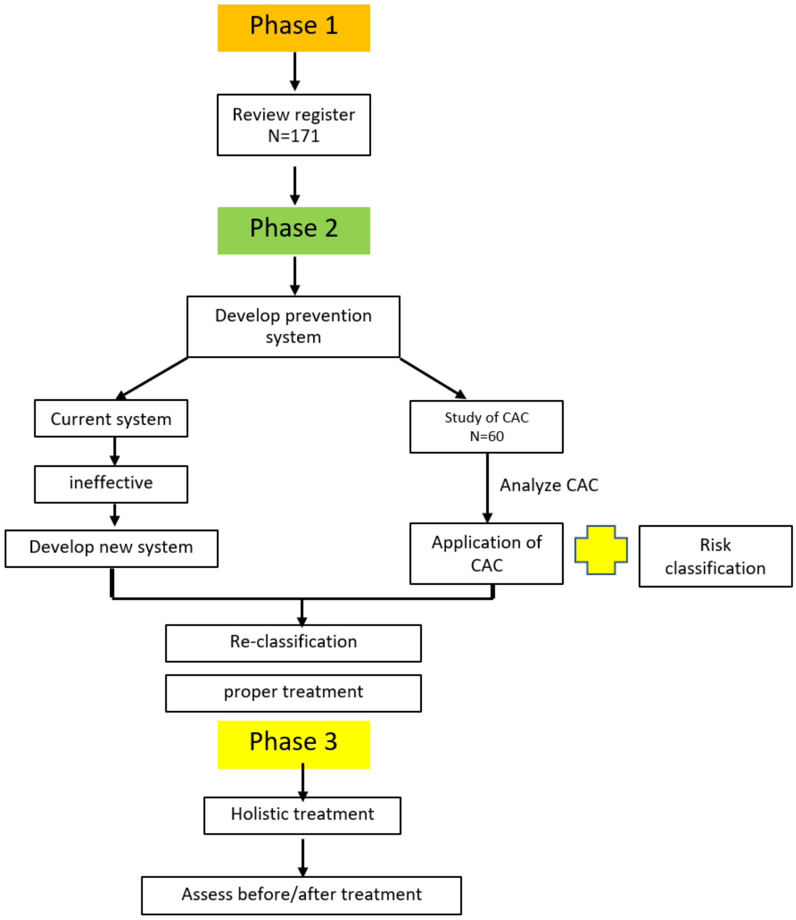

Figure 1: Study protocol

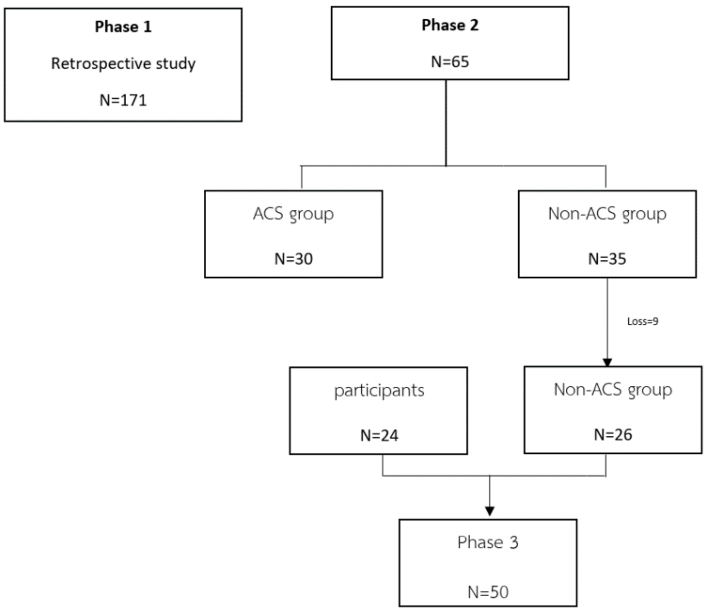

Figure 2: Screening, treatment, and follow-up

Statistical analysis

Categorical variables are expressed as frequency and percentages, normally distributed continuous variables are expressed as mean ± standard deviation (SD), and nonnormally distributed continuous variables are expressed as median (interquartile range [IQR]). Proportions were compared using the chi-squared or Fisher's exact test. For continuous variables, between-group comparisons were performed using an independent-samples T test for normally distributed data or a Mann–Whitney U test for nonnormally distributed data, and within-group comparisons were performed using a paired sample T test for normally distributed data or Wilcoxon signed-rank test for nonnormally distributed data. $P < 0.05$ was considered statistically significant. All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 25.

Results

Of the 171 patients, 56.7% were female. The patients' average age was 62.4 ± 13.9 years. Furthermore, 90.6% had hypertension, 45% had diabetes mellitus, and 59.1% had dyslipidemia. The average 10-year ASCVD risk score was 19.3 ± 17.1, and the average Thai cardiovascular risk score was 18.9 ± 9.9. Only 45% of patients with cardiovascular risk factors received an appropriate level of statin based on their individual 10-year ASCVD risk score. Among those receiving inappropriate treatment, 75.3% received statin undertreatment and 24.7% received statin overtreatment (**Table 1**).

Table 1. Baseline characteristics of the Phase 1 cohort

	Total (n = 171)	Minimum	Maximum
Age (years)	62.4 ± 13.9	28	91
Women (%)	56.7		
Hypertension (%)	90.6		
Diabetes mellitus (%)	45		
Dyslipidemia (%)	59.1		
ASCVD risk score	19.3 ± 17.1	0.3	72.7
Thai cardiovascular risk score	18.9 ± 9.9	1.42	30
Statin use (%)	71.9		
Antihypertensive use (%)	87.7		
ASA use (%)	21.1		
Smoking (%)	15.2		
Adequate blood pressure (%)	19.3		
Total cholesterol (mg/dL)	174.3 ± 40.4	73	270
LDL cholesterol (mg/dL)	95.5 ± 35.2	25	205
HDL cholesterol (mg/dL)	50.6 ± 15.1	19	120
Fasting blood glucose (mg/dL)	118.4 ± 45.9	48	320

Data are shown as n (%) or mean ± standard deviation.

Table 2. Comparison of patients receiving appropriate and inappropriate statin treatment

	Appropriate statin (n = 78)	**Inappropriate statin** (n = 93)	p value
Age (years)	64.4 ± 13.3	60.8 ± 14.3	0.74
Women (%)	55.1	58.1	0.70
Hypertension (%)	93.6	88.2	0.22
Diabetes mellitus (%)	34.6	53.8	0.01
Dyslipidemia (%)	61.5	57	0.54
ASCVD risk score	19.5 ± 16.7	19.1 ± 17.5	0.89
Thai cardiovascular risk score	19.2 ± 9.3	18.7 ± 10.4	0.73
Statin use (%)	83.3	62.4	0.01
Antihypertensive use (%)	94.8	81.7	0.10
ASA use (%)	20.5	21.5	0.87
Smoking (%)	15.4	15.1	0.95
Adequate blood pressure (%)	17.9	20.4	0.68
Total cholesterol (mg/dL)	174.6 ± 38.4	174.1 ± 42.2	0.94
LDL cholesterol (mg/dL)	97.5 ± 36	93.9 ± 34.5	0.50
HDL cholesterol (mg/dL)	51.9 ± 12.5	49.6 ± 17	0.32
Fasting blood glucose (mg/dL)	113.5 ± 42.6	122.5 ± 48.4	0.20

Data are shown as n (%) or mean ± standard deviation.

Using the data above, patients were divided into two groups based on whether they received appropriate statin (45%) or inappropriate statin (55%). The appropriate treatment group had an average age of 64.4 ± 13.3 years, with 55.1% being women, 93.6% having hypertension, 34.6% having diabetes mellitus, and 61.5% having dyslipidemia. The inappropriate treatment group had an average age of 60.8 ± 14.3 years, with 58.1% being women, 88.2% having hypertension, 53.8% having diabetes mellitus, and 57% having dyslipidemia. Of these, the number of patients with diabetes mellitus receiving inappropriate statin was significantly greater than the number of patients without diabetes receiving inappropriate statin (**Table 2**).

Table 3. Comparison of clinicodemographic characteristics between patients receiving statin undertreatment and statin overtreatment

	Statin undertreatment (n = 70)	Statin overtreatment (n = 23)	p value
Age (years)	62.6 ± 13.9	55.3 ± 14.1	0.033
Women (%)	48.6	87	0.001
Hypertension (%)	88.6	87	0.835
Diabetes mellitus (%)	70	4.3	<0.001
Dyslipidemia (%)	48.6	82.6	0.004
ASCVD risk score	22.6 ± 17	8.7 ± 15	0.001
Thai cardiovascular risk score	21.9 ± 9	9 ± 8.3	<0.001

Statin use (%)	50	100	<0.001
Antihypertensive use (%)	80	87	0.631
ASA use (%)	25.7	8.7	0.085
Smoking (%)	17.1	8.7	0.326
Adequate blood pressure (%)	17.1	30.4	0.232
Total cholesterol (mg/dL)	177.6 ± 44	163.7 ± 35.2	0.172
LDL cholesterol (mg/dL)	97.7 ± 34.2	82.1 ± 33.6	0.06
HDL cholesterol (mg/dL)	46.6 ± 14.9	58.6 ± 20	0.003
Fasting blood glucose (mg/dL)	130.4 ± 52.1	98.3 ± 21.8	<0.001

Data are shown as n (%) or mean ± standard deviation.

The statin undertreatment group had an average age of 62.6 ± 13.9 years, with 48.6% being women, 88.6% having hypertension, 70% having diabetes mellitus, and 48.6% having dyslipidemia, whereas the statin overtreatment group had an average age of 55.3 ± 14.1 years, with 87% being women, 87% having hypertension, 4.3% having diabetes mellitus, and 82.6% having dyslipidemia. Patients with diabetes mellitus had a significantly higher rate of statin undertreatment than patients without diabetes. Furthermore, patients with dyslipidemia received significantly more statin overtreatment than those without dyslipidemia (**Table 3**).

Table 4. Comparison of clinicodemographic characteristics between the ACS and non-ACS groups

	Total (n = 65)	ACS group (n = 30)	Non-ACS group (n = 35)	p value
Age (years)	61.2 ± 11.3	65.3 ± 10.7	57.8 ± 10.8	0.007
Women (%)	24 (35.8%)	9 (30%)	15 (42.9%)	0.284
Smoking (%)	27 (40.3%)	14 (46.7%)	13 (37.1%)	0.437
Hypertension (%)	44 (65.7%)	17 (56.7%)	27 (77.1%)	0.078
Diabetes mellitus (%)	20 (29.9%)	10 (33.3%)	10 (28.6%)	0.678
Dyslipidemia (%)	35 (52.2%)	11 (36.7%)	24 (68.6%)	0.01
ASCVD risk score	20.9 ± 17.1	23.5 ± 16.9	18.7 ± 17.2	0.271
Thai cardiovascular risk score	19.8 ± 9.9	22.2 ± 8	17.7 ± 10.9	0.07
CACS (Agatston score)	39.3 (IQR: 0–357.9)	417.5 (IQR: 147.2–688.2)	0 (IQR: 0–27.9)	<0.001
LM	0 (IQR: 0–2.6)	0.6 (IQR: 0–18.5)	0 (IQR: 0–0)	<0.001
LAD	20.3 (IQR: 0–118.2)	129 (IQR: 49.4–373.8)	0 (IQR: 0–1)	<0.001
LCX	0 (IQR: 0–44.5)	47.7 (IQR: 0–137.9)	0 (IQR: 0–0)	<0.001
RCA	2.8 (IQR: 0–91.9)	106.1 (IQR: 36–229.2)	0 (IQR: 0–0.3)	<0.001
Total cholesterol (mg/dL)	186.8 ± 58.6	176.2 ± 68.4	196 ± 48	0.176
LDL cholesterol (mg/dL)	114.7 ± 45.8	109.1 ± 49.9	119.5 ± 42	0.366
HDL cholesterol (mg/dL)	42.2 ± 11.6	39 ± 8.8	45 ± 13.1	0.038
Fasting blood glucose (mg/dL)	126.8 ± 56.4	127.5 ± 60.9	126.1 ± 53.1	0.924

Data are shown as n (%), mean ± standard deviation, or median (interquartile range).

Among the 65 patients in Phase 2, 30 had ACS and 35 did not. The overall cohort had an average age of 61.2 ± 11.3 years, with 35.8% being women, 29.9% having diabetes mellitus, 65.7% having hypertension, and 52.2% having dyslipidemia. In the ACS group, 26 patients (86.7%) had NSTEMI, and 4 (13.3%) had STEMI. The average CACS was 39.3 (IQR: 0–357.9), with a significantly higher average in the ACS group (417.5; IQR: 147.2–688.2) than in the non-ACS group (0; IQR: 0–27.9; Table 4).

Table 5. Baseline characteristics and comparison of before and after treatment

	Total = 50 n (%)	before	after	P value
Age (years)	61.9 ± 10.5			
Women (%)	16 (32%)			
Diabetes mellitus (%)	17 (34%)			
Hypertension (%)	36 (72%)			
Dyslipidemia (%)	32 (64%)			
Aspirin use (%)	25 (50%)			
Thai cardiovascular risk	21.7 ± 9.2			
ASCVD risk	22.3 ± 16.6			
Total cholesterol (mg/dL)		200.1 ± 53.2	148.2 ± 38.5	<0.001
LDL (mg/dL)		127.4 ± 43.2	77.7 ± 32.2	<0.001
HDL (mg/dL)		41.1 ± 10.3	37.9 ± 9.7	0.04
Fasting blood glucose (mg/dL)		130.3 ± 56.4	115.7 ± 50.4	0.022
SBP (mmHg)		141.8 ± 15.6	121.9 ± 13.5	0.001
DBP (mmHg)		78.6 ± 12.4	69.7 ± 11.5	0.001
BW (Kg)		67.1 ± 12.6	66 ± 11.7	0.01
Smoking (%)		22 (44%)	15 (30%)	0.007

Data are shown as n (%), mean ± SD

In Phase 3, a comparison of 50 patients before and after the development and implementation of a new paradigm treatment with a multidisciplinary approach for primary prevention revealed an average age of 61.9 ± 10.5 years, with 32% being women, 34% having diabetes mellitus, 72% having hypertension, and 64% having dyslipidemia. Before treatment, the average total cholesterol was 200.1 ± 53.2 mg/dL, fasting blood sugar was 130.3 ± 56.4 mg/dL, systolic blood pressure was 141.8 ± 15.6 mmHg, and average body weight was 67.1 ± 12.6 kg; additionally, 44% of the patients were smokers. After treatment, the average total cholesterol was 148.2 ± 38.5 mg/dL, fasting blood glucose was 115.7 ± 50.4 mg/dL, systolic blood pressure was 121.9 ± 13.5 mmHg, and the average body weight was 66 ± 11.7 kg; additionally, the percentage of smokers decreased to 30%. All of these parameters showed significant differences before and after treatment (**Table 5**).

Discussion

This study was conducted in three phases to identify gaps in the primary prevention of ACS in Phetchabun Hospital and to develop a new system to improve the effectiveness of prevention strategies. In the past, primary prevention at Phetchabun Hospital was inadequate and inefficient in addressing individual patients' risks, and the physicians may not have consistently followed standard guidelines. In particular, dyslipidemia treatment was provided at a lower rate than that recommended in the ESC 2019 clinical practice guidelines on dyslipidemia management.[19] This discrepancy was notable in patients with concomitant diabetes, who received significantly lower statin therapy than recommended compared with the patient without diabetes (p = 0.01). Furthermore, patients with a lower cardiovascular risk score were likelier to receive statin overtreatment. These findings highlight the need for more individualized, risk-based treatment, especially using the CACS for risk assessment. The use of CACS can facilitate a more effective risk stratification of patients.

Phase 2 results revealed that the CACS helped distinguish patients with ACS from those without ACS, with statistically significant difference. In contrast, a previous study[26] concluded that the CACS was not helpful in differentiating patients with acute chest pain from those with non-cardiac chest pain. This discrepancy may be attributed to differences in study populations: The present study had a predominance of patients with NSTEMI, which may affect the CACS compared with the STEMI group, and the average age of the patients in this study was relatively high. Consequently, incorporating CACS into the differential diagnosis of ACS may be particularly beneficial for patients with NSTEMI. Future studies should explore whether the highest calcium score in each coronary artery corresponds to the culprit lesion.

In addition to its role in improving risk stratification, the CACS may also help identify patients with acute chest pain because of the simplicity and rapidity of the process and the lack of contrast media–related adverse effects or coronary angiogram–related complications.

In Phase 3, the implementation of holistic integration and a multidisciplinary team approach significantly improved treatment outcomes.

Conclusion

This study revealed the ineffective and inconsistent clinical practice of primary prevention of ACS at Phetchabun Hospital, particularly in terms of adherence to guidelines, resulting in ineffective prevention of ACS. The findings indicate that CACS is effective for distinguishing acute ACS from non-ACS and may help in patient risk stratification. Furthermore, a holistic, multidisciplinary team approach was found to significantly improve the efficacy of the primary prevention system.

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