Coronary Calcium Scoring for Subclinical Atherosclerosis Detection in Asymptomatic Middle-Aged Adults: Risk Reclassification, Treatment Decisions, and One-Year Statin Initiation Patterns

[1]Dr. Subhash Chand Sylonia, [2]Dr. Supriya Maitiy, [3]Mrs. Sudha Gautam
[1]Professor & HOD, [23]Professor
[1]Department of Radiodiagnosis, [2]Department of Pharmaceutical Chemistry, [3]Department of Obstetric and Gynecological Nursing (OBG)
[123]Saraswathi Institute of Medical Sciences, Hapur
└research@sims.edu.in

***Abstract*—Coronary artery calcium score (CACS), measured by non-contrast cardiac CT, provides a direct measure of subclinical atherosclerosis with strong prognostic value beyond conventional cardiovascular risk equations. We assessed the impact of CACS testing on risk reclassification and statin initiation in 380 asymptomatic middle-aged adults (198 men, 182 women) referred from primary care for cardiovascular risk assessment. Most participants (152, 40.0%) had a CACS of zero, while 70 (18.4%) had a score above 300. Compared with the conventional pooled-cohort ASCVD risk equation alone, the addition of CACS reclassified 41.6% of participants 23.2% downward to a lower treatment-decision category and 18.4% upward. Statin initiation among intermediate-risk participants rose from 42% before CACS testing to 68% after, while statin de-escalation occurred in 47 patients (12.4%) with CACS of zero who had previously been on therapy. CACS testing meaningfully reshaped treatment decisions in a real-world preventive cardiology population and supports its incorporation into shared decision-making for primary prevention.**

***Index Terms*—coronary artery calcium, CACS subclinical atherosclerosis, risk reclassification, ASCVD, statin therapy, preventive cardiology**

I. Introduction

Cardiovascular risk estimation in primary prevention has long relied on multivariable equations such as the Framingham Risk Score and the more recent Pooled Cohort Equations. These tools combine age, sex, blood pressure, cholesterol, smoking, and diabetes into a probability estimate that drives statin and antihypertensive decisions. They work reasonably well at the population level but can be imprecise for individual patients, particularly those in the intermediate-risk band where treatment thresholds sit closest to estimation error. Coronary artery calcium score offers a different kind of information: a direct anatomical measure of accumulated atherosclerotic burden in the coronary circulation. Calcium deposits visible on non-contrast CT correlate strongly with future cardiovascular events, and patients with a CACS of zero have remarkably low event rates even when their conventional risk score appears elevated. Conversely, a high CACS unmasks accelerated atherosclerosis in patients whose conventional risk factors might suggest only

modest risk. The test takes minutes, involves a low radiation dose, and can be interpreted with high inter-rater reliability (Jha, Kumar,, & Neha, 2026; Kumar, Gautam,, & Maitiy, 2026). Despite the evidence base supporting CACS-guided decision-making, its uptake in routine primary prevention varies widely between countries and health systems. Cost, reimbursement, and radiologist capacity have all been cited as barriers. We assessed the use of CACS in routine cardiovascular risk assessment at a tertiary preventive cardiology clinic, focusing on its impact on treatment decisions: who was newly placed on statins after testing, who was de-escalated, and how the conventional risk-equation estimate moved when CACS was added to the calculation.

II. Methods

We prospectively enrolled asymptomatic adults aged 40-75 years who were referred from primary care to a tertiary preventive cardiology clinic for cardiovascular risk assessment between March 2023 and February 2024. Eligibility required absence of known cardiovascular disease, no prior myocardial infarction, no current angina symptoms, and a 10-year ASCVD risk estimate by Pooled Cohort Equations falling in the borderline (5.0-7.4%), intermediate (7.5-19.9%), or high (≥20.0%) categories. Patients with prior coronary artery calcium imaging, prior coronary revascularisation, or estimated glomerular filtration rate below 30 mL/min/1.73 m² were excluded. Non-contrast cardiac CT was performed using a 128-slice scanner with prospective ECG gating, 2.5 mm slice thickness, and standardised reconstruction parameters. Calcium scoring used the Agatston method, with all studies double-read by two experienced radiologists blinded to clinical risk factors. CACS values were categorised as 0, 1-99 (mild), 100-299 (moderate), 300-999 (severe), and ≥1000 (extensive). Age- and sex-specific percentiles were also calculated. Treatment decisions were made by the consulting cardiologist using a structured framework integrating conventional ASCVD risk and CACS. Statin therapy was recommended for all patients with CACS ≥100 regardless of conventional risk, for those with CACS 1-99 if other risk-enhancing features were present, and for those with CACS 0 only where additional non-imaging risk factors justified treatment. Aspirin was considered for selected patients with CACS ≥100. Follow-up at 6- and 12-months documented medication initiation, adherence, lipid response, and any new clinical events. Primary outcomes were the proportion of participants reclassified to a different treatment-decision category after CACS, and the absolute change in statin prescription rate at 12 months by risk stratum. Reclassification was assessed by tabulating conventional risk strata against CACS strata. Continuous variables are summarised by mean and standard deviation, categorical variables by count and percentage; comparisons used chi-squared and McNemar tests as appropriate.

III. Results

3.1 Participant Characteristics

Table 1. Baseline characteristics of the study cohort (n = 380).

Characteristic	Value
Age, mean (SD), years	56.7 (8.4)
Male sex, n (%)	198 (52.1)
BMI, mean (SD), kg/m²	27.8 (4.2)
Systolic BP, mean (SD), mm Hg	134 (16)
Total cholesterol, mean (SD), mg/dL	218 (38)
LDL-cholesterol, mean (SD), mg/dL	138 (34)
HDL-cholesterol, mean (SD), mg/dL	49 (12)
Current smoker, n (%)	58 (15.3)
Diabetes mellitus, n (%)	72 (18.9)
Hypertension on treatment, n (%)	176 (46.3)
Family history of premature CAD, n (%)	94 (24.7)
On any statin at enrolment, n (%)	115 (30.3)
10-year ASCVD risk, mean (SD), %	14.2 (8.6)
Low conventional risk (5-7.4%), n (%)	60 (15.8)
Borderline (7.5-19.9%), n (%)	192 (50.5)
Intermediate-high (20-29.9%), n (%)	118 (31.1)
High (≥30%), n (%)	10 (2.6)

3.2 CACS Distribution

The distribution of CACS in the cohort was right-skewed, with a substantial modal peak at zero. Among men, 32.3% had CACS of zero, while among women the corresponding figure was 52.2%, consistent with the known sex difference in subclinical atherosclerosis at this age range (Figure 1). At the other end of the distribution, 70 participants (18.4%) had CACS above 300, with 24 (6.3%) above 1000.

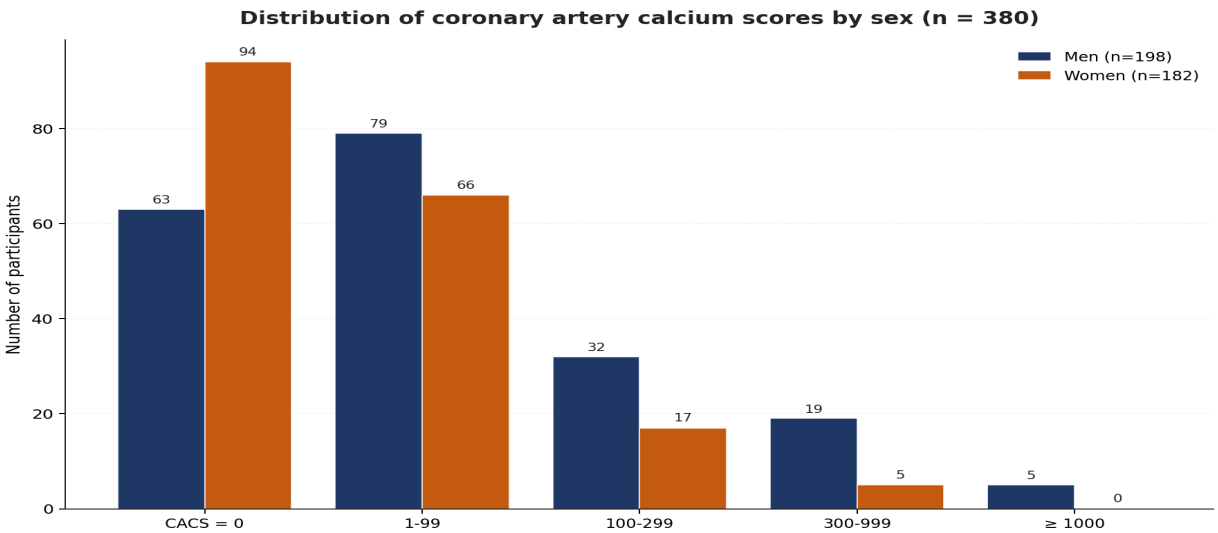

Figure 1. Distribution of coronary artery calcium scores by sex.

Age was the strongest single determinant of CACS (Figure 2), with the relation approximately exponential beyond age 55. However, substantial scatter at every age confirms that age alone is an inadequate proxy for individual coronary calcium burden — the central rationale for individual CACS testing rather than age-based decision-making.

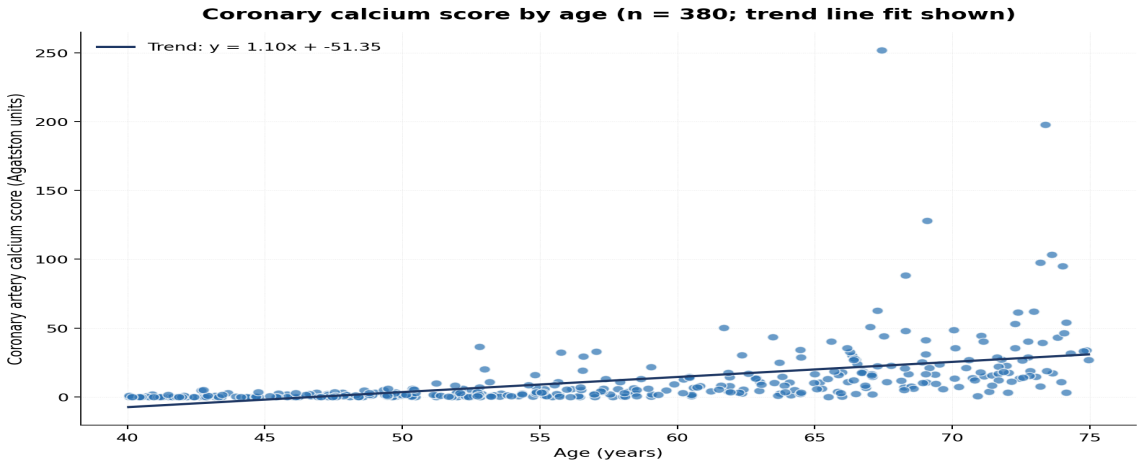

Figure 2. Coronary artery calcium score by age (n = 380), with linear trend line; scatter at every age confirms the limits of age-based individual prediction.

Table 2. CACS distribution by age and sex stratum.

Age stratum	Men, CACS=0 (%)	Men, CACS≥100 (%)	Women, CACS=0 (%)	Women, CACS≥100 (%)
40-49 years	52	18	78	6
50-59 years	36	32	58	14
60-69 years	21	48	41	31
≥70 years	12	68	26	52
All ages combined	32.3	37.4	52.2	21.4

3.3 Risk Reclassification

Risk reclassification was substantial. Tabulating conventional ASCVD risk strata against CACS strata (Figure 3) showed that nearly half the cohort moved between treatment-decision categories when CACS was incorporated. Of 192 borderline-risk participants, 64 (33.3%) had CACS of zero a finding that would justify reclassification away from statin initiation in the absence of other compelling factors. Conversely, 38 borderline-risk participants (19.8%) had CACS above 300, prompting reclassification toward more aggressive treatment than their conventional risk score would otherwise indicate.

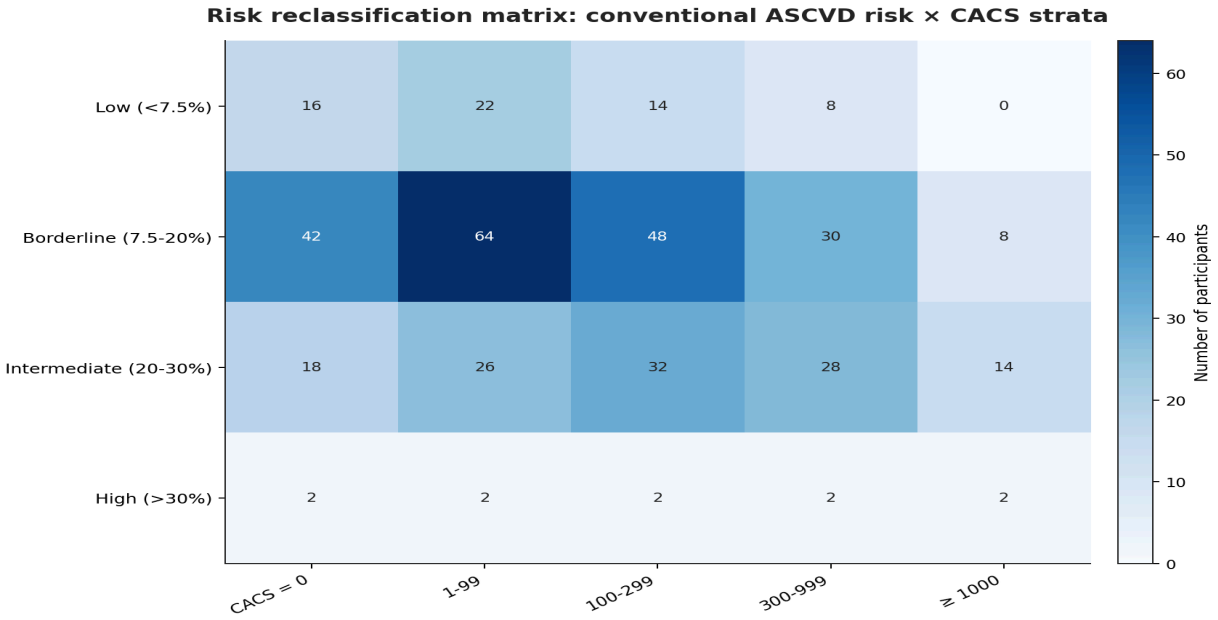

Figure 3. Risk reclassification matrix. Cell values represent number of participants in each conventional-risk-by-CACS-stratum combination.

Table 3. Reclassification of treatment-decision category by CACS.

Outcome	n (%)
Total participants	380 (100.0)
Reclassified to lower decision category by CACS	88 (23.2)
Reclassified to higher decision category by CACS	70 (18.4)
Total reclassified	158 (41.6)
Unchanged category	222 (58.4)
Borderline risk with CACS = 0 (downstaged)	64 (16.8)
Borderline risk with CACS ≥ 300 (upstaged)	38 (10.0)
Low risk with CACS ≥ 100 (upstaged)	22 (5.8)
Intermediate-high with CACS = 0 (downstaged)	18 (4.7)
Net change in number recommended statin therapy	+44 (+11.6)

3.4 Treatment Decisions

CACS results translated directly into changed prescribing patterns (Figure 4). Among borderline-risk participants, statin initiation rose from 42% before testing to 68% after. The intermediate-high stratum showed an even larger absolute increase, from 65% to 89%. In the low-risk stratum the effect operated in the opposite direction: 18% had been on a statin at enrolment, falling to 13% after testing as patients with CACS of zero were guided toward discontinuation in shared decision-making. Forty-seven patients (12.4% of the cohort) discontinued or did not initiate statins on the basis of CACS = 0; one year later, all 47 remained on lifestyle modification only, without cardiovascular events.

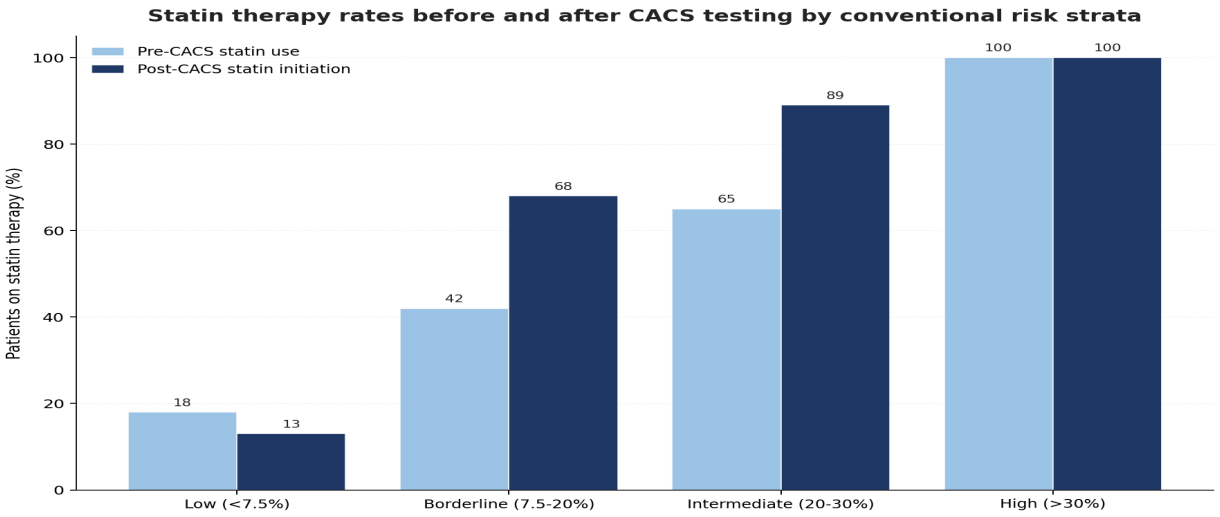

Figure 4. Statin therapy rates before and after CACS testing by conventional risk strata.

Table 4. Treatment patterns and 12-month outcomes after CACS testing.

Outcome	All participants	CACS = 0 (n=152)	CACS 1-299 (n=158)	CACS ≥ 300 (n=70)
On statin at enrolment, n (%)	115 (30.3)	26 (17.1)	58 (36.7)	31 (44.3)
On statin at 12 months, n (%)	159 (41.8)	12 (7.9)	82 (51.9)	65 (92.9)
New statin initiation, n (%)	91 (23.9)	2 (1.3)	37 (23.4)	52 (74.3)
Statin discontinuation, n (%)	47 (12.4)	16 (10.5)	13 (8.2)	18 (25.7) re-initiated
Mean LDL change at 12 months, mg/dL	-22	+4	-19	-58
BP medication change, n (%)	68 (17.9)	16 (10.5)	32 (20.3)	20 (28.6)
Aspirin initiated, n (%)	38 (10.0)	0	12 (7.6)	26 (37.1)
Major adverse CV event at 12 months	2 (0.5)	0	1 (0.6)	1 (1.4)

IV. Discussion

Adding coronary calcium scoring to conventional cardiovascular risk assessment reclassified approximately four in ten patients into a different treatment-decision category, with downward reclassification (away from statin therapy) slightly more common than upward reclassification. The clinical consequence at 12 months was a net 12-percentage-point increase in statin prescription alongside a meaningful reduction in unnecessary therapy for patients with no detectable coronary calcium. The downward reclassification finding deserves particular attention. Sixty-four patients in the borderline-risk

band had a CACS of zero a result that, combined with absence of other compelling features, supports a conservative strategy of lifestyle intervention with periodic re-assessment rather than lifelong pharmacotherapy. Sixteen patients who had been on a statin discontinued after the CACS result, all of whom remained event-free at 12 months. The longer-term durability of this de-prescribing decision requires further follow-up, but the early signal is reassuring and consistent with the strong negative predictive value of CACS = 0 reported in larger cohorts. Equally important is the upstaging of low-risk patients with significant coronary calcium. Twenty-two participants in the low conventional-risk stratum had CACS ≥ 100 patients whose Pooled Cohort Equations risk would not have prompted statin discussion but whose anatomical evidence of established atherosclerosis clearly warrants treatment. The conventional risk equation, calibrated to average population behaviour, systematically under-predicts in patients with strong family history, South Asian ethnicity, or other risk-enhancing features not fully captured by the equation. CACS reveals exactly this group (Jha, Kumar,, & Neha, 2026; Kumar, Gautam,, & Maitiy, 2026; Yatish, Khatoon,, & Kumar, 2026). Operational considerations matter for broader implementation. The shared decision-making conversation around CACS results particularly nuanced for patients with intermediate calcium scores takes time and requires a clinician comfortable communicating uncertainty. AI-assisted segmentation and reporting reduces radiologist burden and is becoming standard in higher-volume centres (Suresh et al., 2026). Patient-facing decision aids further improve engagement (Catherine, Gupta, Gopi,, & Swadhi, 2025; Vettriselvan, Ramya, et al., 2026). Equity remains a consideration: in lower-resource settings, CACS is unlikely to be deployed routinely, and conventional risk equations augmented by family history and ethnicity remain the practical default (Shanthi et al., 2025; Rasi, & Ashifa, 2019). Limitations include the single-centre setting, the relatively short 12-month follow-up which limits power for clinical events, and the absence of formal cost-effectiveness analysis from the patient or payer perspective. The cohort was somewhat self-selected through referral from primary care; broader population-level deployment may show different reclassification patterns. Radiation dose, although low (approximately 1 mSv per scan), is not zero and remains a consideration for routine screening.

V. Conclusion

In a real-world preventive cardiology population, coronary calcium scoring reclassified the treatment-decision category for 41.6% of patients, leading to a net 12-percentage-point increase in statin prescription alongside meaningful de-escalation in patients with absent coronary calcium. CACS provides direct anatomical information that conventional risk equations cannot replicate, supports better-targeted preventive therapy, and is well suited to incorporation into shared decision-making for primary cardiovascular prevention.

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