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ORIGINAL RESEARCH

# Gensini Score's Severity and Its Relationship with Risk Factors for Coronary Artery Disease Among Patients Who Underwent Angiography in Somalia's Largest PCI Centre

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**Aim:** Coronary artery diseases (CAD) are chronic disorders in which atherosclerosis plays a major role in their pathogenesis. Their severity is directly related to cardiovascular outcomes. The assessment of Coronary Artery severity is quite complex, in which different parameters are used, such as the gensini score, syntax score, etc.

**Methods:** This was a retrospective study of adult (≥18 years) patients who underwent angiography in Mogadishu Somali Türkiye Training and Research Hospital from June 2022 to September 2023. Gensini scores were calculated to determine the extent and severity of atherosclerosis among patients with coronary artery disease.

**Results:** A total of 278 participants (78% male and 22%% women) were analyzed. Their risk factors were assessed with hypertension being the leading risk factor (48%). While a significant relationship was found between gensini score and dyslipidemia in patients with chronic ischemic heart disease (p 0.035), no significance was found with other risk factors On the other hand, the Gensini score had a significant correlation with the final decision of management (medical, PCI vs CABG).

**Conclusion:** This study indicated that the Gensini score can be used as a guide for CAD decisions.

**Keywords:** stable coronary artery disease, acute coronary syndrome, Gensini score

## Introduction

Globally, ischemic heart disease is the primary cause of both mortality and morbidity. Atherosclerosis plays a major role in its pathogenesis.[1]

The main cardiovascular risk factors include hypertension, dyslipidemia, diabetes, smoking, alcohol, and obesity. Therefore, it is generally best to identify patients with cardiovascular risk factors and take preventive measures.

Although the predictive validity of coronary risk factors is unknown, arterial calcification has been linked to an increased risk of cardiovascular events.[2] Although there are various clinical risk scores available, it is difficult to predict cardiovascular events, and many at-risk patients are not properly categorised based just on conventional risk factors.[3]

In the 1960s, mortality-related coronary artery disease among middle-aged males had one of the highest rates in the world. Since 2000, the mortality rate for middle-aged males has fallen by roughly one-quarter of its peak. In 2016, it is anticipated that more than 12,000 Somalis will die from coronary artery disease.[4] Revascularization using either PCI or CABG is mandatory to enhance clinical outcomes.

The coronary artery atherosclerotic lesions were determined using the Gensini scoring system.

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# Method

This was a retrospective observational study that was done in the angiography department of Mogadishu-Somalia Turkish Training and Research Hospital, the referral hospital in Somalia. Patient selection is shown in Figure 1. In our study, we focused on the assessment of the gensini score in patients with stable and acute coronary syndrome in relation to their risk factors.

## Study Procedure

Two interventional cardiologists reviewed each case to determine their Gensini score. Additionally, a hospital-based information system was used to retrieve the patients' sociodemographics.

The Gensini score is a comprehensive angiographic score that reflects the magnitude of coronary atherosclerotic disease burden. Although this method is not perfect, it provides more relevant information than just categorising patients as single, double, or triple. The following are considered to be the benefits of this scoring approach: It accurately stratified patients based on the functional relevance of their condition; it provides for continuous, microprocessor-assisted interobserver investigations as well as intraobserver variability.[5]

Generally, using quantitative coronary angiography, the extent of stenosis and the values of Gensini scores (GS) are assessed at least twice by interventional cardiologists, and the average values are used to minimize inter-observer variability.

Significant stenosis was defined as stenosis of ≥50% of the main coronary arteries or stenosis of ≥70% in other coronary arteries. Non-significant lesions were defined as stenosis of any lesser degree.[6,7] The prevalence of CAD was determined using the Gensini scoring system.

Their angiographic findings based on the genuine score were grouped into six groups, where the lesion is eccentric or concentric less than 25%, 25 to 50%, 51 to 75%, 76 to 90%, 91 to 99%, and 100%, and given 1, 2, 4, 8, 16, and 30 scores, respectively. The left system, ie, the left anterior descending artery (LAD) and circumflex artery (CX), were multiplied by 2.5, 1.5, and 0.5, respectively. Diagonals 1 and 2 are multiplied by 1x and 0.5x, respectively. The left main was five times multiplied. From proximal to distal, the right system underwent a 1x multiplier—including PDA—while PLA underwent a 0.5x multiplier. Thereafter, Gensini's score was calculated as the sum of the scores for all the coronary arteries.

## Ethical Consideration

Our hospital is a research hospital, and an informed consent is taken from every patient/caregiver before admission to use their data without disclosing their names for research purposes from the hospital medical records. The study was approved by the research ethics committee of Mogadishu Somali Turkey Training and Research Hospital (Ethics Protocol No.: MSTH/15324). The study was performed in line with the principles of the Declaration of Helsinki.

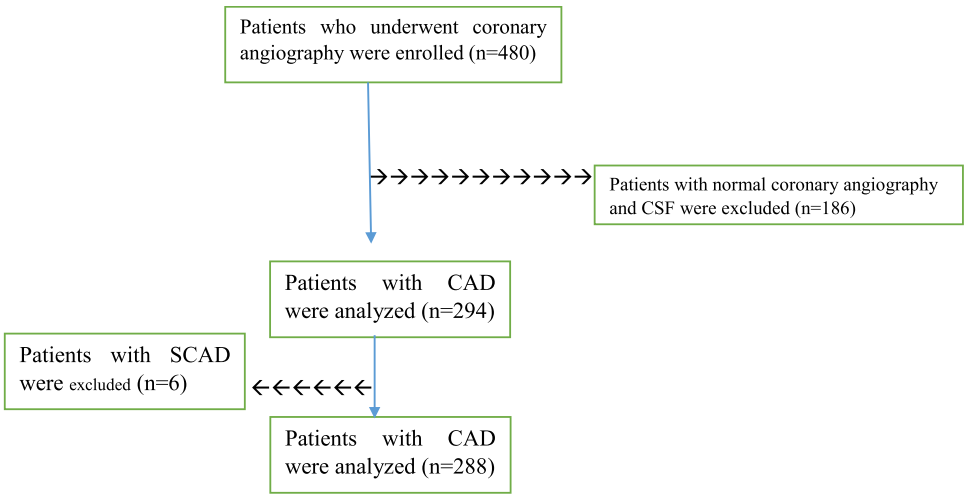


**Figure 1** Flow chart of patient selection.
**Abbreviations**: CAD, coronary artery disease; SCD, Spontaneous coronary dissection; CA, coronary aneurysm; CSF, coronary slow flow.

## Statistical Analysis

Normality distribution of the variables was tested using one sample Kolmogorov–Smirnov test. Continuous variables are represented by median (min – max).; frequencies and percentages were used to illustrate categorical variables. The Pearson chi-square test and Kruskal–Wallis test were used for the evaluation of categorical data. Dual comparisons between groups exhibiting significant values were evaluated with the Mann–Whitney *U*-test. SPSS software version 26 was used to conduct the statistical analysis. A p-value of $< 0.05$ was considered as statistically significant.

# Result

480 patients who had coronary angiographies performed from June 2022 to September 2023 were evaluated. 278 patients who had atherosclerotic coronary artery disease in angiography were included in this study. The demographic characteristics of the patients included in the study are shown in Table 1.

Although 62 patients (22%) had coronary angiography due to chronic ischemic heart disease, 216 patients (78%) were taken for angiography due to acute coronary syndrome (see Table 2), which demonstrates patient distribution according to coronary angiographic features and clinical conditions.

In the evaluation made without taking into account the clinical presentation, no significant relationship was found between the atherosclerotic risk factors DM, HT, dyslipidemia, smoking, and the Gensini score ($p = 0.652$, $p = 0.169$, $p = 0.398$, $p = 0.175$, respectively). While a significant relationship was found between the Gensini score and dyslipidemia in patients with chronic ischemic heart disease (p 0.035), no significance was found with other risk factors. Furthermore, no significant relationship was shown between the gensini score and atherosclerotic risk factors in patients who underwent angiography due to acute coronary syndrome. There was no difference between those with and without LMCA disease in

**Table 1** Demonstrates the Sociodemographic Characteristics of the Patients

| **Variables** | **N%** |
|---|---|
| Age (years) | 61 (26–96) |
| Gender<br>Male<br>Female | <br>217 (78%)<br>61 (22%) |
| Smoker | 76 (27%) |
| Diabetes mellitus | 128 (46%) |
| Hypertension | 133 (48%) |
| Dyslipidemia | 93 (34%) |

**Table 2** Coronary Angiographic Features and Clinical Conditions of Different Patients

| **Variable** | | **N (%)** |
|---|---|---|
| Clinical conditions | | |
| **Chronic coronary artery disease** | | 62 (%23) |
| Acute Coronary syndrome | Unstable angina | 37 (%13) |
| | STEMI | 106 (%38) |
| | NO-NSTEMI | 73 (%26) |

(*Continued*)

**Table 2** (Continued).

| Variable | | N (%) |
|---|---|---|
| **Coronary angiographic findings** | | |
| Obstructive coronary artery disease | LMCA | 27 (%10) |
| | One vessel | 110 (%40) |
| | Two vessel | 63 (%23) |
| | Multiple vessel | 56 (%20) |
| **Nonobstructive coronary artery disease** | | 39 (%14) |

**Abbreviations**: NON-STEMI, Non-ST-Elevation Myocardial Infarction; STEMI, ST-Elevation Myocardial Infarction; LMCA, Left main coronary artery.

terms of DM, HT, dyslipidemia, or smoking. While single-vessel and two-vessel diseases were more common in those with hypertension (p 0.002, p 0.011, respectively), no significant relationship was found between DM, dyslipidemia, smoking, and the number of involved coronary arteries.

Optimal medical treatment was decided for 50 of the patients included in the study (18%), PCI for 174 patients (64%), and CABG for 49 patients (18%).

When the patients' Gensini scores were evaluated according to treatment decision, a statistically significant difference (p 0.05) was found between the groups. While the medical treatment group had the lowest Gensini score, the CABG group had the highest Gensini score (Table 3).

## Discussion

Coronary angiogram scores like the Gensini score and SYNTAX score are considered important for predicting the extent of atherosclerotic burden as well as the success of revascularization.

As a result, the Gensini score is an adequate scoring application utilized to quantify the coronary artery atherosclerosis disease burden in various research studies.[8]

The Gensini score is a better indicator of the total atherosclerotic load because it looks at lesions with as little as 25% luminal stenosis. This is different from the SYNTAX score, which does not include occlusive lesions with less than 50% stenosis. Additionally, according to intracoronary ultrasonography results,[9,10] the Gensini score significantly correlates with both the average plaque burden and the plaque area. On the other hand, in individuals with CCS, both Gensini and SYNTAX scores have a small predictive value for the occurrence of cardiovascular events. Combining these scores improves their predictive value, especially for lower-risk scores.[11,12] In another study using GS, the CAD group was divided into two groups for the purpose of predicting severe CAD. The cut-off value was 7.45%, resulting in a sensitivity of 58.8% and a specificity of 67.2%.[13]

**Table 3** Gensini Score According to Outcome in Terms of Management

| | Gensini Score (Median) | Min | Max | P |
|---|---|---|---|---|
| **Medical therapy** | 5 | 1 | 49 | $P^1$, $p^2$ |
| **PCI** | 55 | 4 | 192 | $P^1$, $p^3$ |
| **CABG** | 100 | 46 | 216 | $P^2$, $p^3$ |

**Notes**: $P^1$: Medical therapy and PCI, p<0.05; $P^2$: Medical therapy and CABG, p<0.05; $P^3$: PCI & CABG, p<0.05.
**Abbreviations**: PCI, percutaneous coronary intervention; CABG, Coronary artery bypass grafting.

In our study, we suggested that the Gensini score could predict the severity and diffusiveness of atherosclerosis burden among different patients with CAD. Genesis scores have no association with the severity or extent of coronary atherosclerosis in patients with acute coronary syndrome.

Risk factors are associated with the occurrence of atherosclerosis, but not with the prevalence and severity of atherosclerosis. The Gensini score accurately predicts the severity of coronary artery disease in the Somali patient population and can guide treatment decisions.

Using these scores alone is not enough; therefore, to improve the prediction of coronary artery disease and select the appropriate therapy, it is important to combine angiography with available risk factors such as arterial hypertension, smoking, diabetes, etc.[14,15]

Studies have demonstrated that CABG treatment, as opposed to PCI, improves patient outcomes for individuals with DM and three-vessel disease.[16]

A recent study has shown that the Gensini score is linked to long-term prognostic effects. The event-free survival rate is significantly different between people with high and low Gensini scores who have non-obstructive CAD and obstructive CAD. A high Gensini score after PCI was linked to a higher risk of cardiac death in HF patients, according to one study. This suggests that the presence of residual coronary atherosclerotic burden may raise the risk of cardiac events like heart failure getting worse, arrhythmias, and coronary artery blockages.[17,18]

## Limitations

Although this was the first study on coronary artery disease in Somalia to determine whether the Gensini score could be the best predictor for the severity of CAD, the limitations of the present study were obvious. The following are some limitations of our studies: First, it is a single-centre retrospective study. Second, the number of participants is small, and the data cannot be generalized.

## Conclusion

The Gensini score is an important and useful instrument for determining the severity of coronary artery disease (CAD). Its importance stems from its capacity to offer a thorough and quantitative assessment of the degree and severity of coronary artery stenosis. This scoring system helps interventionists make decisions about relevant actions and treatment plans. Additionally, the Gensini score is a useful tool in research environments, enabling standardized evaluations and comparisons between various studies and populations. Its widespread recognition in the medical world emphasizes its repeatability and dependability, underscoring its significance in the field of cardiology. All things considered, the Gensini score makes a substantial contribution to the thorough assessment of the severity of CAD, allowing medical professionals to customize therapies to each patient's unique needs.

## Data Sharing Statement

The data is available from the corresponding author and can be accessed upon request.

## Author Contributions

All authors made a significant contribution to this work, whether that is, in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no conflicts of interest.

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