Incidence of Coronary Artery Disease in King Abdulaziz University Hospital, Jeddah, Saudi Arabia, 2019–2020: A Retrospective Cohort Study

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Abstract

Background
Coronary artery disease (CAD) remains a significant cause of death and morbidity in people globally despite advances in treatment. Prevention of CAD risk factors is crucial to reducing its prevalence. We conducted this study to determine the incidence of CAD from 2019 to 2020 in King Abdulaziz University Hospital (KAUH), Jeddah, Kingdom of Saudi Arabia (KSA), and its major risk factors among this population.

Method
This retrospective study involved all patients diagnosed with CAD at KAUH in 2019 and 2020. We analyzed validated hospital data to determine the incidence of CAD and identify the risk factors among participants. The incidence of CAD was calculated based on the total number of patients admitted to KAUH by gender, age group, and nationality (Saudi/non-Saudi).

Result
The study included 1,364 patients with a mean age of 49 years. Most patients were men (n=1,050; 77%), with fewer women (n=314; 23%), and 71.2% were non-Saudi. The incidence of CAD in 2019 was 220.98 per 10,000, and the incidence in 2020 was 3,030.52 per 10,000. However, the incidence for 2020 was confounded by the coronavirus disease 2019 pandemic-related restrictions affecting hospital admissions. The most common diagnosis was acute transmural myocardial infarction, and patients aged <60 years had a significantly high incidence of hypertension, high total cholesterol levels, low low-density lipoprotein levels, and high triglyceride levels. Patients ≥60 years had a significantly high incidence of chronic kidney disease, low hemoglobin levels, history of ischemic heart disease, and intensive care unit or critical care unit admission.

Conclusion
The study demonstrated a significant rise in CAD incidence associated with advanced age and male sex. Further prevention and control of these risk factors would be essential to decrease the incidence of CAD. A national community-based prevention effort should be implemented to avoid the expected CAD epidemic in KSA.

Categories: Cardiology, Internal Medicine, Public Health
Keywords: saudi arabia, cardiovascular disease, coronary artery disease, epidemiology, incidence

Introduction
Coronary artery disease (CAD) is one of the most common cardiovascular disorders worldwide. CAD is the leading cause of death in high-income and low-income countries [1]. Despite advances in preventing and managing this disease, CAD remains a challenge. By 2030, CAD will be the most serious and widespread human health hazard [2].

A decrease in blood flow to the myocardium is the final common pathway leading to death and other complications of CAD (e.g., myocardial infarction and angina). An increased prevalence of obstruction of coronary arteries due to atherosclerosis has been attributed to an age-related rise in disease severity [3]. According to World Health Organization data published in May 2014, CAD is one of the leading causes of death in Saudi Arabia, accounting for 19,569 deaths or 24.34% of total deaths [4]. According to a nationwide survey, Saudi Arabia has a CAD prevalence of 5.5%, which is higher than that in...
China (2%), India (3%), and Europe (5%) but lower than that in the USA (6.7%) and Egypt (8.3%) [5-8]. The body mass index (BMI) studies demonstrated that a waist-to-height ratio cutoff value of 0.5 was effective and that rising adiposity was substantially related to the risk of CAD [9].

Diabetes and hypertension (HTN) are two prominent risk factors that can, directly and indirectly, predict the more severe adverse outcome [10]. Although no definitive association has been shown between cigarette smoking and CAD, cigarette smoking has been connected to thrombocytic and atherogenic pathways and platelet behavior [11]. We conducted this study to assess the incidence of CAD from 2019 to 2020 in King Abdulaziz University Hospital (KAUH), Jeddah, Kingdom of Saudi Arabia, and to determine the significant risk factors for CAD.

Materials And Methods
This retrospective study involved all patients diagnosed with CAD at KAUH between 2019 and 2020. We analyzed validated hospital data to determine the incidence of CAD and related risk factors. The incidence of CAD in the present study was calculated based on the total number of patients admitted to KAUH by gender, age group, and nationality (Saudi/non-Saudi) in 2019 and 2020. The total number of patients with CAD was 1,802 of 46,574 admissions (573 per 10,000). The inclusion criteria were all patients, regardless of age and sex, diagnosed with CAD, and the exclusion criteria were all patients other than complaints of CAD or patients with incomplete medical records. A checklist was prepared to include patient demographic data, smoking habits, diabetes status, HTN, history of stroke, malignancy, chronic kidney disease (CKD), family history of CAD, past history of heart-related diseases or surgery, laboratory results, and electrocardiogram (ECG) findings.

The retrospective, noninterventional study was approved by the biomedical research unit at King Abdul Aziz University (Approval No. 629-20). The Unit of Biomedical Ethics is registered at the National Committee of Biomedical and Medical Ethics (Reg No. HA-02-J-008).

Statistical analysis
Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0. (IBM Corp., Armonk, NY). Qualitative data were expressed as numbers and percentages, and the chi-squared test (χ²) was used to test the relationship between variables. Quantitative data were expressed as mean and standard deviation (mean ± SD), where the independent sample t-test was used for parametric variables. A p-value of <0.05 was considered statistically significant.

Results
This study enrolled 1,802 patients initially and then we excluded the patients with missing data, leaving 1,364 patients in the study. Our patient population consisted of 1,050 men (77%) and 314 women (23%), with a mean age of 49 years (Table 1). Men were more commonly affected than women, and most were unemployed (n=1,030; 73.5%). A total of 917 (67.2%) participants were non-Saudi, and most were married (n=1,241; 90.9%). The mean BMI of the study population was 29.20 kg/m² ± 17.597 kg/m². Only 29.9% of the population of CAD patients had a healthy weight. The incidence of CAD in 2019 was 220.89 per 10,000 patients; in 2020, the incidence was 3,030.52 per 10,000 patients. However, hospital admissions were restricted in 2020 due to coronavirus disease 2019 (COVID-19) pandemic precautions, which confounded our data.
Table 1 presents the risk factor analysis. Most patients (n=878; 64.4%) were nonsmokers, 904 (66.3%) had HTN, and 836 (61.3%) had diabetes. Only 408 patients (29.9%) had a family history of CAD, stroke, and HTN. In addition, 67 patients had a history of stroke (4.9%), 36 had active malignancy (2.6%), and 87 had CKD (6.4%). More than half the population (n=814; 59.7%) had abnormal ECG findings, and 711 (52.1%) had low hemoglobin levels. Clotting factors were within the reference range in 78 patients (4%), and 714 (52.3%) had high levels of glycated hemoglobin (HbA1c), an indicator of diabetes. A total of 889 (65.2%) patients had high troponin levels, and 831 (60.9%) had cardiac enzyme levels within reference ranges. Blood cholesterol...
levels were within the reference range in 884 (64.8 \%) patients, and 696 (51.0\%) had normal levels of high-density lipoprotein (HDL). Also, 356 (26.1 \%) patients had high levels of low-density lipoprotein (LDL), and 904 (66.3\%) had triglycerides within reference ranges.

| Variable                                      | N  = 1364 | Percent (%) |
|-----------------------------------------------|-----------|-------------|
| Smoking habits                                |           |             |
| Yes                                           | 264       | 19.4\%      |
| No                                            | 878       | 64.4\%      |
| Former (quit smoking)                         | 222       | 16.3\%      |
| Hypertension                                  |           |             |
| Yes                                           | 904       | 66.3\%      |
| No                                            | 460       | 33.7\%      |
| Diabetes                                      |           |             |
| Yes                                           | 836       | 61.3\%      |
| No                                            | 528       | 38.7\%      |
| Stroke                                        |           |             |
| Yes                                           | 67        | 4.9\%       |
| No                                            | 1297      | 95.1\%      |
| Active malignancy                             |           |             |
| Yes                                           | 36        | 2.6\%       |
| No                                            | 1328      | 97.4\%      |
| Chronic kidney disease                        |           |             |
| Yes                                           | 87        | 6.4\%       |
| No                                            | 1277      | 93.6\%      |
| Others                                        |           |             |
| Yes                                           | 48        | 3.5\%       |
| No                                            | 1316      | 96.5\%      |
| Family history of coronary artery, stroke, or hypertension | | |
| Yes                                           | 408       | 29.9\%      |
| No                                            | 949       | 69.6\%      |
| ECG finding                                   |           |             |
| Normal                                        | 97        | 7.1\%       |
| Abnormal                                      | 814       | 59.7\%      |
| Not found                                      | 453       | 33.2\%      |
| Hemoglobin                                    |           |             |
| High                                          | 30        | 2.2\%       |
| Normal                                        | 610       | 44.7\%      |
| Low                                           | 711       | 52.1\%      |
| Not found                                      | 13        | 1.0\%       |
| Clotting factors                              |           |             |
| High                                          | 365       | 26.8\%      |
| Risk Factor          | High      | 65.2% | Normal | 22.9% | Low     | 7.9% | Not found | 4.0% |
|----------------------|-----------|-------|--------|-------|---------|------|-----------|------|
| Cardiac enzyme troponin | 889       |       | 313    |       | 108     |      | 54        |      |
| Cardiac enzyme CK    | 435       | 31.9% | 831    | 60.9% | 20      | 1.5% | 78        | 5.7% |
| Blood cholesterol    | 275       | 20.2% | 884    | 64.8% | 4       | 0.3% | 201       | 14.7%|
| HDL                  | 43        | 3.2%  | 696    | 51.0% | 303     | 22.2%| 322       | 23.6%|
| LDL                  | 356       | 26.1% | 713    | 52.3% | 3       | 0.2% | 292       | 21.4%|
| Triglycerides        | 212       | 15.5% | 904    | 66.3% | 4       | 0.3% | 244       | 17.9%|

**TABLE 2: Distribution of the participants regarding CAD risk factors**
Table 3 shows that 494 (36.2%) patients had a history of past angina pectoris, 389 (28.5%) had a myocardial infarction, and 228 (16.7%) had heart failure. Only 159 patients (11.7%) had a history of ischemic heart disease (IHD), 500 (36.7%) had a history of cardiac catheterization, and 214 (15.7%) had a history of coronary artery angioplasty. In addition, 315 (22.9%) patients had a history of percutaneous coronary intervention. Most patients (n=1,267; 92.9%) had inpatient episodes, of whom 916 (67.2%) had their episodes in the coronary care unit (CCU). The most common diagnoses were acute transmural myocardial infarction (n=652; 47.8%), acute subendocardial myocardial infarction (n=377; 27.6%), and unstable angina (n=220; 16.1%).

| Variable                                      | N=1364 | Percent (%) |
|-----------------------------------------------|--------|-------------|
| **Episode location**                          |        |             |
| CCU                                           | 916    | 67.2%       |
| Female section                                | 67     | 4.9%        |
| Male section                                  | 117    | 8.5%        |
| ERU                                           | 34     | 2.5%        |
| MIC                                           | 49     | 3.6%        |
| DCU                                           | 9      | 0.7%        |
| PT                                            | 6      | 0.4%        |
| SIC and ERO                                    | 48     | 3.5%        |
| Other                                         | 10     | 0.7%        |
| **Diagnosis**                                 |        |             |
| Unstable angina                               | 220    | 16.1%       |
| Acute subendocardial myocardial infarction     | 377    | 27.6%       |
| Acute transmural myocardial infarction         | 652    | 47.8%       |
| Angina pectoris                                | 70     | 5.1%        |
| Acute ischemic heart disease                   | 37     | 2.7%        |
| Chronic ischemic heart disease                 | 8      | 0.6%        |
| Previous angina pectoris                       |        |             |
| Yes                                           | 494    | 36.2%       |
| No                                            | 870    | 63.8%       |
| Previous myocardial infarction                 |        |             |
| Yes                                           | 389    | 28.5%       |
| No                                            | 975    | 71.5%       |
| Previous heart failure                         |        |             |
| Yes                                           | 228    | 16.7%       |
| No                                            | 1136   | 83.3%       |
| Past IHD                                      |        |             |
| Yes                                           | 159    | 11.7%       |
| No                                            | 1205   | 88.3%       |

Abbreviations: CAD, coronary artery disease; ECG, electrocardiogram; CK, creatine kinase; HbA1c, glycated hemoglobin; HDL, high-density lipoprotein; LDL, low-density lipoprotein.
In our study population, 646 (84.4%) patients younger than age 60 years were males, and 195 patients aged 60 or older (32.6%) were females (Table 4). In addition, 272 (19.9%) patients were employed (p<0.05), while a significant number of those aged 60 or older were Saudi (p<0.05). A total of 311 (40.7%) patients younger than 60 years were overweight, and significantly more patients younger than 60 were smokers than those older than age 60 (p<0.05). We found no significant difference between the two age groups regarding changes in eating habits to help lower or control blood pressure, exercise, physical activity, or diagnoses (p>0.05).
| Variable                        | Age < 60 years (n=765) | Age ≥ 60 years (n=599) | p-Value |
|--------------------------------|------------------------|------------------------|---------|
| Gender                         |                        |                        |         |
| Male                           | 646 (84.4%)            | 404 (67.4%)            | 0.00    |
| Female                         | 119 (15.6%)            | 195 (32.6%)            | 0.00    |
| Nationality                    |                        |                        |         |
| Saudi                          | 220 (28.8%)            | 227 (37.9%)            | 0.00    |
| Non-Saudi                      | 545 (71.2%)            | 372 (62.1%)            | 0.00    |
| Marital status                 |                        |                        |         |
| Married                        | 687 (89.8%)            | 554 (92.5%)            | 0.08    |
| Unmarried                      | 78 (10.2%)             | 45 (7.5%)              | 0.08    |
| Occupation                     |                        |                        |         |
| Employed                       | 170 (22.2%)            | 102 (17.0%)            | 0.03    |
| Retirement                     | 566 (74.0%)            | 464 (77.5%)            | 0.03    |
| Unemployed                     | 29 (3.8%)              | 33 (5.5%)              | 0.03    |
| BMI                            |                        |                        |         |
| Underweight                    | 5 (0.7%)               | 10 (1.7%)              | 0.05    |
| Normal weight                  | 232 (30.3%)            | 176 (29.4%)            | 0.05    |
| Overweight                     | 311 (40.7%)            | 215 (35.9%)            | 0.05    |
| Obesity                        | 217 (28.4%)            | 198 (33.1%)            | 0.05    |
| Smoking habits                 |                        |                        |         |
| Yes                            | 180 (23.5%)            | 84 (14.0%)             | 0.00    |
| No                             | 458 (59.9%)            | 420 (70.1%)            | 0.00    |
| Former smoker                  | 127 (16.6 %)           | 95 (15.9%)             | 0.00    |
| Exercise                       |                        |                        |         |
| Yes                            | 268 (34.8%)            | 185 (30.9%)            | 0.00    |
| No                             | 387 (50.6%)            | 299 (49.9%)            | 0.00    |
| Rest                           | 112 (14.6%)            | 114 (19.0%)            | 0.00    |
| Changing eating habits to help lower or control blood pressure |                     |                        |         |
| Yes                            | 59 (7.7%)              | 55 (9.2%)              | 0.33    |
| No                             | 706 (92.3%)            | 544 (90.8%)            | 0.33    |

**TABLE 4: Relationship between participant age groups and their characteristics and special habits**

Abbreviation: BMI, body mass index.

Patients aged 60 or older (i.e., older patients) had a significantly higher mean height compared to those younger than 60 years (i.e., younger patients; p<0.05; Table 5). However, younger patients had a significantly higher mean weight than older patients.
| Variable          | Age <60 years (n=765) | Age ≥60 years (n=599) | p-Value |
|-------------------|-----------------------|-----------------------|---------|
| Mean height ± SD  | 165.94 ± 9.93 cm      | 163.02 ± 9.42 cm      | 0.00    |
| Mean weight ± SD  | 80.36 ± 49.90 kg      | 75.32 ± 15.41 kg      | 0.02    |

**TABLE 5: Mean height and weight by age group**

Significantly more older patients had low hemoglobin levels (n=342; 57.1%) than younger patients (p<0.05; Table 6). Significantly more younger patients had high cholesterol levels (24.2%), lower LDL levels (0.3%), and higher triglyceride levels (17.9%; p<0.05) than the older patients. More younger patients were smokers and had HTN than older patients (p<0.05). However, CKD was significantly more common in older patients than the younger patients (p<0.05). We found no significant difference in BMI, ECG findings, clotting factors, HbA1c, HDL, cardiac enzyme troponin, and CK.
|                          | Column 1 | Column 2 | Column 3 |
|--------------------------|----------|----------|----------|
| Normal                   | 462 (60.4%) | 369 (61.6%) | 0.95     |
| Low                      | 11 (1.4%) | 9 (1.5%)  | 0.95     |
| Not found                | 43 (5.6%) | 35 (5.8%) | 0.95     |
| Blood cholesterol        |          |          |          |
| High                     | 185 (24.2%) | 90 (15.0%) | 0.00     |
| Normal                   | 476 (62.2%) | 408 (68.1%) | 0.00     |
| Low                      | 1 (0.1%) | 3 (0.5%)  | 0.00     |
| Not found                | 103 (13.5%) | 98 (16.4%) | 0.00     |
| HDL                      |          |          |          |
| High                     | 26 (3.4%) | 17 (2.8%) | 0.46     |
| Normal                   | 398 (52.0%) | 298 (49.7%) | 0.46     |
| Low                      | 174 (22.7%) | 129 (21.5%) | 0.46     |
| Not found                | 167 (21.8%) | 155 (25.9%) | 0.46     |
| LDL                      |          |          |          |
| High                     | 231 (30.2%) | 125 (20.9%) | 0.00     |
| Normal                   | 384 (50.2%) | 329 (54.9%) | 0.00     |
| Low                      | 2 (0.3%) | 1 (0.2%)  | 0.00     |
| Not found                | 148 (19.3%) | 144 (24.0%) | 0.00     |
| Triglycerides             |          |          |          |
| High                     | 137 (17.9%) | 75 (12.5%) | 0.04     |
| Normal                   | 497 (65.0%) | 407 (67.9%) | 0.04     |
| Low                      | 3 (0.4%) | 1 (0.2%)  | 0.04     |
| Not found                | 128 (16.7%) | 116 (19.4%) | 0.04     |
| Hypertension              |          |          |          |
| Yes                      | 471 (61.6%) | 433 (72.3%) | 0.00     |
| No                       | 294 (38.4%) | 166 (27.7%) | 0.00     |
| Diabetes                  |          |          |          |
| Yes                      | 451 (59.0%) | 385 (64.3%) | 0.05     |
| No                       | 314 (41.0%) | 214 (35.7%) | 0.05     |
| Stroke                   |          |          |          |
| Yes                      | 30 (3.9%) | 37 (6.2%)  | 0.06     |
| No                       | 735 (96.1%) | 562 (93.8%) | 0.06     |
| Active malignancy        |          |          |          |
| Yes                      | 21 (2.7%) | 15 (2.5%)  | 0.88     |
| No                       | 744 (97.3%) | 584 (97.5%) | 0.88     |
| CKD                      |          |          |          |
| Yes                      | 38 (5.0%) | 49 (8.2%)  | 0.02     |
| No                       | 727 (95.0%) | 550 (91.8%) | 0.02     |
| Others                   |          |          |          |
| Yes                      | 22 (2.9%) | 26 (4.3%)  | 0.15     |
|                  | Yes          | No          | P-value |
|------------------|--------------|-------------|---------|
| **Family history of the coronary artery, stroke, or hypertension** |              |             |         |
| Yes              | 216 (28.2%)  | 192 (32.1%) | 0.13    |
| No               | 549 (71.8%)  | 407 (67.9%) | 0.13    |
| **Previous angina pectoris** |              |             |         |
| Yes              | 277 (36.2%)  | 217 (36.2%) | 0.11    |
| No               | 488 (63.8%)  | 382 (63.8%) | 0.11    |
| **Previous myocardial infarction** |              |             |         |
| Yes              | 209 (27.3%)  | 180 (30.1%) | 0.37    |
| No               | 556 (72.7%)  | 419 (69.9%) | 0.37    |
| **Previous heart failure** |              |             |         |
| Yes              | 117 (15.3%)  | 111 (18.5%) | 0.11    |
| No               | 648 (84.7%)  | 488 (81.5%) | 0.11    |
| **Past IHD**     |              |             |         |
| Yes              | 77 (10.1%)   | 82 (13.7%)  | 0.04    |
| No               | 688 (89.9%)  | 517 (86.3%) | 0.04    |
| **History of cardiac catheterization** |              |             |         |
| Yes              | 269 (35.2%)  | 231 (38.6%) | 0.21    |
| No               | 496 (64.8%)  | 368 (61.4%) | 0.21    |
| **Coronary angioplasty** |              |             |         |
| Yes              | 118 (15.4%)  | 96 (16.0%)  | 0.86    |
| No               | 647 (84.6%)  | 503 (84.0%) | 0.86    |
| **Coronary artery bypass surgery** |              |             |         |
| Yes              | 34 (4.4%)    | 28 (4.7%)   | 0.84    |
| No               | 731 (95.6%)  | 571 (95.3%) | 0.84    |
| **PCI**          |              |             |         |
| Yes              | 181 (23.7%)  | 132 (22.0%) | 0.58    |
| No               | 584 (76.3%)  | 467 (78.0%) | 0.58    |
| **Episode type** |              |             |         |
| Inpatient        | 63 (8.2%)    | 0 (0.0%)    | 0.00    |
| Emergency        | 702 (91.8%)  | 599 (100.0%)| 0.00    |
| **Episode location** |            |             |         |
| CCU              | 562 (73.5%)  | 354 (59.1%) | 0.00    |
| Female section   | 31 (4.0%)    | 36 (6.0%)   | 0.00    |
| Male section     | 50 (6.5%)    | 67 (11.2%)  | 0.00    |
| ERU              | 17 (2.2%)    | 17 (2.8%)   | 0.00    |
| MIC              | 8 (1.0%)     | 41 (6.8%)   | 0.00    |
| DCU              | 2 (0.3%)     | 7 (1.2%)    | 0.00    |
| PT               | 1 (0.1%)     | 5 (0.8%)    | 0.00    |
| Table 6: Relationship between patient age and past medical/family history and laboratory findings |
|---------------------------------------------------------------|
| **History of IHD** was significantly more common in older patients (13.7%; p<0.05) than in younger patients. Inpatient care was significantly more common in younger patients (8.2%) than in older patients, whose care more often occurred in the CCU or ICU (p<0.05). We found no significant differences between the two age groups regarding past angina pectoris, myocardial infarction, cardiac catheterization, coronary artery bypass surgery, percutaneous coronary intervention, diabetes, stroke, malignancy, family history of CAD stroke, or HTN (p>0.05).

**Discussion**

We found an incidence of CAD in 2019 of 220.89 per 10,000. The 2020 COVID-19 pandemic-related restrictions on hospital admissions confounded our data for 2020 because only critical cases were admitted (such as CAD patients). However, for reporting purposes, the CAD incidence was 3,030.52 per 10,000 patients that year. According to a United Arab Emirates study, the incidence rate of major CAD per 10,000 person-years was 127, and higher systolic blood pressure (SBP) strongly predicted CAD in both men and women [12]. This agrees with the findings of our study, which revealed that the frequency rate of CAD among patients with high blood pressure was 66.3% per 1,364 patients in all age groups. The correlation between higher SBP and CAD in both men and women has been documented in previous studies [13,14].

CAD incidence rates vary globally among different high-risk populations. A recent five-year study in a neighboring Arab country found that the incidence rate of CAD among patients with diabetes was 17.6 per 10000 person-years, which is lower than the frequency rate determined in our study [12]. A study of Italian patients with diabetes found that men and women had higher CAD incidence rates of 288 and 235 per 10,000 person-years, respectively, than our study [15]. The prevalence rate of CAD among patients with diabetes was 61.3% in our study. In India, an 11-year population-based study of diabetes patients found a CAD incidence rate of 5.6 cases per 1000 person-years, which is lower than our study’s frequency rate of CAD [16].

Previous studies reported that age is a major nonmodifiable risk factor linked to significant CAD occurrence [17,18]. In our study, age was a significant predictor of major CAD in men but not women, considering other risk variables [18,19]. In Europe and North America, the average age of patients with CAD is 60 to 65 years [5], higher than the average age of 56 years reported in a multicenter Middle Eastern population-based study [20]. The average age of the participants in our study was 59 years, indicating that the population at risk of CAD is younger than 60 years. This emphasizes the need for early detection of CAD and its risk factors.

Our findings revealed that younger patients with a smoking history (23.5% of the population) had a considerably greater risk of CAD than nonsmokers. Other classic cardiovascular risk variables (e.g., diabetes and serum lipids) are negatively influenced by cigarette smoking, and HTN has a multiplier effect on the incidence of CAD [21]. Smokers younger than 50 have a 10-fold increased risk of CAD compared to nonsmokers of the same age [22]. In our study, 19.4% of the participants were current smokers, and 16.3%...
were ex-smokers. In two previous studies, current smoking was significantly associated with increased risk, while ex-smokers had a higher risk than nonsmokers but lower than current smokers [23,24].

Risk factors analysis in this study found that 59% of patients under 60 have diabetes and 52.3% had a high HbA1c level. HbA1c reflects glucose control and is a significant predictor of CAD incidence in both sexes; CAD risk increases in patients as their HbA1c levels increase [23,24]. Diabetes is a significant risk factor for CAD [25].

In our study, 30.4% of the participants were obese. Being obese or overweight exacerbates or aggravates all atherogenic risk factors that predispose people to coronary events, regardless of age [26]. Current evidence suggests that BMI is independently related to CAD in patients with established coronary atherosclerosis and that the risk is enhanced even at mildly raised BMI levels [27].

The prevalence of high cholesterol and triglyceride levels in the present study were 20.2% and 15.5%, respectively. Previous research shows that a single risk factor (e.g., hypercholesterolemia or HTN) is responsible for the development of CAD [28]. Previous studies showed that a triglyceride level of 90 mg/dL raises the risk of CAD [22].

Studies in other countries showed positive connections between CAD and changes in population mean risk factors [23]. A longitudinal study may be required to demonstrate the effect of lifestyle changes by losing weight, increasing physical activity, quitting smoking, controlling HTN, controlling diabetes, and actively managing the metabolic syndrome in reducing the risk of CAD in Saudi Arabia [23,29].

Our study had several important limitations. First, this was a single-center study, and therefore a more extensive multicenter study is warranted to support our results. Secondly, restrictions due to COVID-19 precautions confounded our 2020 data. A repeat study where such pandemic-related restrictions are appropriately absent would strengthen the data.

Conclusions
We conducted this study to assess the incidence of CAD from 2019 to 2020 in KAUH and to determine the major risk factors for CAD. We found a significant increase in the incidence of CAD. The increase was markedly observed among older male patients. Therefore, monitoring these variables in patients with CAD is advisable. Based on our results, a national community-based prevention effort should be implemented to avoid the expected CAD epidemic in Saudi Arabia. Measures to modify lifestyle and address metabolic syndrome management are required.

Additional Information
Disclosures
Human subjects: Consent was obtained or waived by all participants in this study. Unit of Biomedical Ethics Research Committee at King AbdulAziz University. issued approval Reference No 629-20. This study was approved by the Institutional Review Board of King Abdulaziz University (Reference No 629-20) Non-Intervention (Retrospective, Cohort Study). Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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