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METABOLIC SYNDROME AND CORONARY ARTERY STENOSIS: AN ADJUSTED ANALYSIS BY AGE, SEX, AND SMOKING

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Resume. This study analyzed data from 188 patients who underwent angiography to assess the presence of metabolic syndrome. Diagnosis was based on established criteria, including central obesity, hypertension, low level of high-density lipoprotein cholesterol (HDL-C), and elevated triglyceride levels, with the presence of three or more parameters confirming metabolic syndrome. The dataset was further examined in relation to coronary artery stenosis, sex, age, and smoking habits to derive clinically meaningful conclusions regarding risk factors and associations.

Keywords: *metabolic syndrome, coronary angiography, coronary artery occlusion*

Relevance. Metabolic syndrome combines central obesity, dyslipidemia, hypertension and impaired glucose regulation — conditions strongly linked to atherosclerosis and plaque progression. Several observational studies and meta-analyses have shown that MetS is associated with greater coronary artery disease burden and adverse plaque characteristics, suggesting a mechanistic pathway to occlusion; a recent meta-analysis and cohort studies therefore motivate focused investigation of angiographic occlusion as a clinically meaningful endpoint [1].

Angiography provides direct, objective assessment of luminal obstruction and collateralization, so studying patients who underwent angiography lets researchers relate MetS to anatomical severity rather than only to clinical events. For example, observational work has found that MetS and its individual components are associated with poorer coronary collateral formation and more severe chronic total occlusion, implying that MetS may affect both the presence and the physiological consequences of occlusive lesions [2].

Adjusting for age, sex, and smoking is essential because these factors are strong, independent determinants of coronary atherosclerosis and could confound the MetS–occlusion relationship. Age shifts baseline risk, sex modifies plaque distribution and clinical presentation, and smoking accelerates atherogenesis — so multivariable logistic or regression models are required to estimate the *independent* effect of MetS while preserving clinical interpretability. Recent imaging and cohort studies continue to explore plaque phenotype and severity in MetS subgroups, reinforcing the need for angiography-based, adjusted analyses to inform risk stratification and management [3].

Aim: To determine whether metabolic syndrome is independently associated with coronary artery stenosis in patients undergoing angiography, and to quantify the strength and precision of that association after adjusting for age, sex, and smoking using multivariable logistic regression and descriptive subgroup analyses.

Objectives:

1. Find out if metabolic syndrome affects coronary artery stenosis. Determine whether patients with metabolic syndrome are more likely to have significant coronary artery stenosis than those without.

2. Account for key factors. See if any association remains after adjusting for age, sex, and smoking.

3. Describe and check the data. Show how metabolic syndrome, age, sex, and smoking are distributed across the angiography groups and confirm the results are reliable (check counts and model stability).

Materials and methods. We kept patient data in Excel, cleaned and recoded variables (Metabolic Syndrome, Sex, Smoking) and removed incomplete records. We used Excel pivot tables and bar charts to look at how metabolic syndrome relates to coronary occlusion overall and by sex. The cleaned data were then analyzed with logistic regression to see if metabolic syndrome predicts significant coronary artery stenosis after adjusting for age, sex, and smoking; results are shown as adjusted odds ratios with confidence intervals and p-values, and we checked model stability and data counts.

Results and Discussion. About 45 % of patients in the sample had metabolic syndrome (MetS), with a marked sex difference: MetS was much more common in women (~64 %) than in men (~35 %) (Exploratory data analysis (EDA) with pivot tables.). Excel pivot tables and clustered bar charts summarized these distributions by coronary stenosis category and showed no clear unadjusted pattern — percentages of MetS did not consistently rise or fall with the presence of significant coronary artery. In the adjusted analysis (streamlined logistic regression including MetS, age, sex, and smoking), MetS was not independently associated with coronary artery significant stenosis (adjusted OR ≈ 0.96, 95 % CI 0.41–2.25, p = 0.93). Age showed a small, non-significant upward trend (aOR ≈ 1.03 per year; p = 0.22). Male sex had a higher point estimate for coronary artery stenosis (aOR ≈ 1.69) but this was not statistically significant (p = 0.26), and smoking showed no clear effect (aOR ≈ 1.22; p = 0.69).

Taken together, the descriptive and multivariable results indicate no detectable independent effect of metabolic syndrome on coronary artery stenosis in this angiography cohort after accounting for age, sex, and smoking. The adjusted OR near 1 and the large p-value support a null finding in this sample; however, the wide 95 % confidence interval means a moderate protective or harmful effect cannot be definitively excluded, so the estimate is imprecise.

Key reasons for caution are evident in the diagnostics: pivot tables revealed a sex imbalance and some sparse cells, and the wide confidence intervals point to limited precision — likely due to sample size or uneven group counts. Because sex is strongly associated with MetS and may relate to coronary disease patterns, it is a potential confounder; adjusting for sex (and age, smoking) attenuated any raw differences seen in the pivots.

Practical next steps include reporting raw counts alongside percentages, performing sex-stratified analyses and fuller multivariable models that include additional

clinical covariates (e. g., diabetes, hypertension, lipids), and considering penalized regression or larger samples to improve estimate stability. In summary, this study found no clear independent association between MetS and significant coronary artery stenosis, but limitations in precision and group balance mean further investigation is warranted.

Table 1

Statistical analysis results after including other variables

Variable	Coefficient (log-odds)	Adjusted OR	95 % Cl lower	95 % Cl upper	p-value
Intercept (const)	-0,1976	0,8207	0,0673	10,0113	0,8769
MetS	-0,0359	0,9647	0,414	2,2481	0,9337
Age (per year)	0,0248	1,0251	0,9852	1,0667	0,2211
Sex (male=1)	0,5247	1,69	0,6751	4,2306	0,2624
Smoking (1 vs 0)	0,1967	1,2174	0,4669	3,1739	0,6875

Conclusion:

1. No independent effect of metabolic syndrome — after adjusting for age, sex, and smoking, metabolic syndrome was not associated with coronary artery stenosis (aOR ≈ 0.96), so there is no clear evidence it independently predicts significant coronary artery stenosis in this sample.
2. The wide 95 % confidence interval (0.41–2.25) means a moderate protective or harmful effect cannot be ruled out; the result is uncertain.
3. Age, sex, and smoking showed only non-significant point estimates (small age trend; higher point estimate for men; no clear smoking effect).
4. MetS prevalence was much higher in women (~64 %) than men (~35 %), making gender a key characteristic and potential confounder.
5. Pivot tables and charts did not reveal a consistent increase of MetS with presence of significant coronary artery stenosis before adjustment.

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