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Insulin resistance in non- diabetic patients with coronary artery disease

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Abstract
Background
- Coronary artery disease (CAD) remains one of the leading causes of
- morbidity and mortality worldwide.
- Although diabetes mellitus is a well-established risk factor for CAD, a substantial proportion of non-diabetic individuals also develop premature and severe coronary atherosclerosis.
- Increasing evidence indicates that insulin resistance (IR) plays a central role in the pathogenesis of CAD even in the absence of overt hyperglycemia.
- Insulin resistance is characterized by reduced biological response to normal insulin levels, leading to compensatory hyperinsulinemia.
- It acts as a pro atherogenic state where free fatty acids will be
- increased leds to -> ↓HDL and ↑ LDL.

Keywords: Insulin resistance, coronary artery disease, non-diabetic cad, hyperinsulinemia, homa-ir

Introduction

Aim & Objectives
- To evaluate association of plasma insulin and insulin resistance (HOMA-IR) with Coronary Artery Disease (CAD) in non-diabetic subjects.

Objectives
- To compare insulin resistance(HOMA- IR)between non diabetic CAD patients and glycemia matched non CAD patients
- To assess whether insulin resistance alone is an independent risk factor for CAD.

Methodology
Case–control study at KVG Medical College Hospital
- Total number of participants = 100
- 50 CAD patients (MI/ angio-proven CAD)
- 50 matched control group

Statistical analysis: chi-square multivariate regression.

Anthropometry & Labs
BMI, Waist–Hip Ratio (WHR)
- **Lipid profile:** Total Cholesterol (TC), Triglycerides (TGL), LDL, HDL
- Fasting glucose and insulin.
- HOMA IR –(Homeostasis Model Assessment of Insulin Resistance).

$$\text{HOMA -IR} = \frac{\text{Fasting glucose (mgldl) x fasting insulin (µU/ml)}}{405}$$

Fasting insulin and HOMA –IR were used as surrogate markers of insulin resistance in our study.

Inclusion Criteria
Documented myocardial infarction, substantiated by Q waves in electrocardiogram (ECG) or regional wall motion abnormality on echocardiogram.

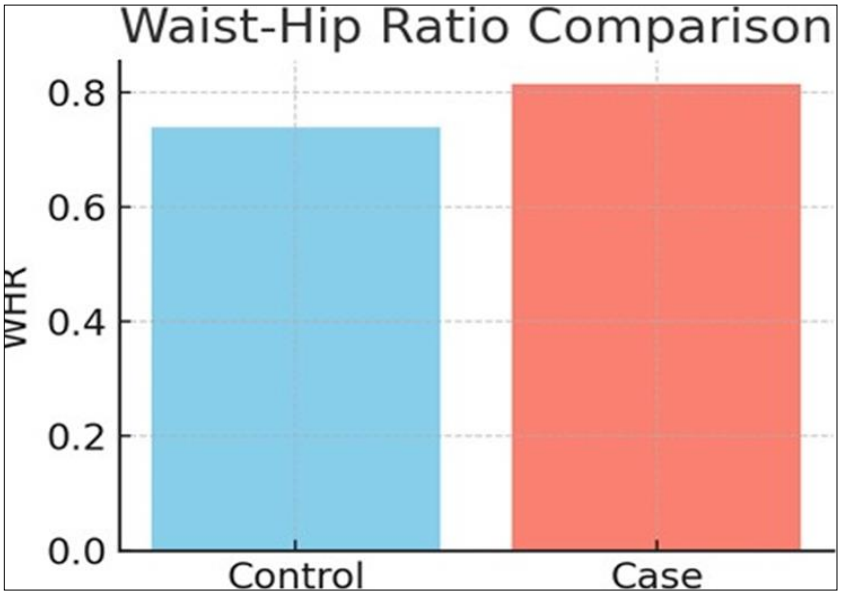
Angina supported by
- ST depression or T wave inversion
- coronary angiographic evidence of >60% stenosis of one or more vessels.

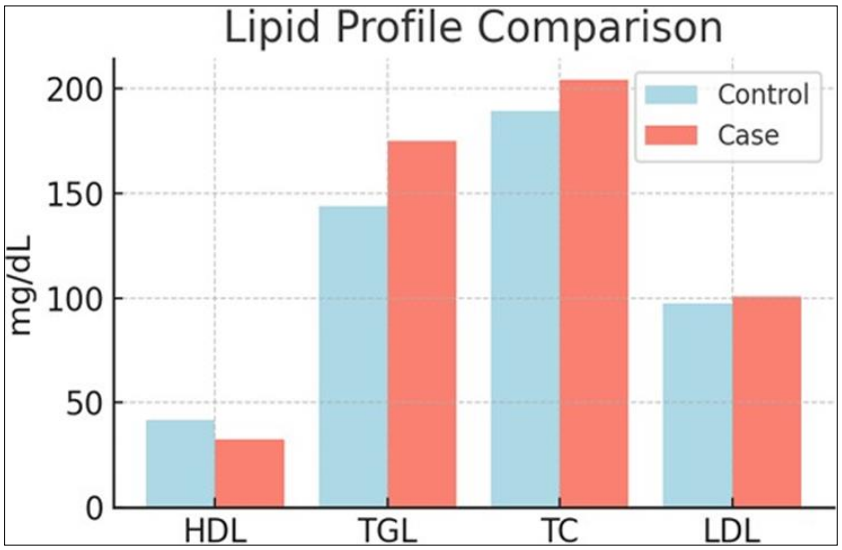
Exclusion Criteria
- Diabetes Mellitus, which was diagnosed according to American diabetes association
- Acute heart failure
- Hepatic dysfunction
- Serum creatinine>1.4 mg/dl
- Patients receiving hormone replacement therapy
- Patients on steroids.

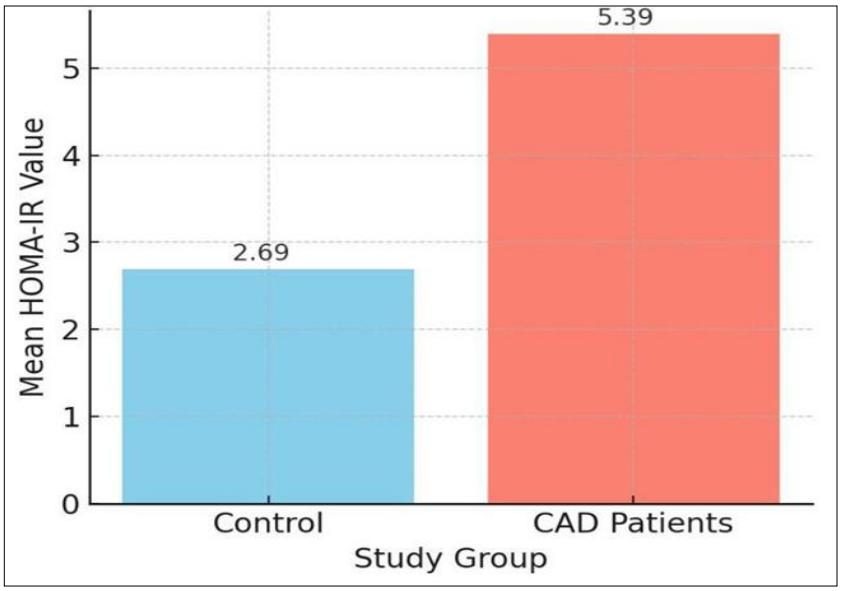
Comparison of Clinical & Biochemical Parameters

Parameter	Case (Mean ± SD)	Control (Mean ± SD)	p-value	Comment
Age (yrs)	51.6 ± 6.9	51.18 ± 5.9	0.746	Not significant
BMI (kg/m²)	24.4 ± 3.03	27.5 ± 3.12	0.494	Not significant
WHR	0.815 ± 0.099	0.739 ± 0.082	<0.01	Significant ↑ in cases

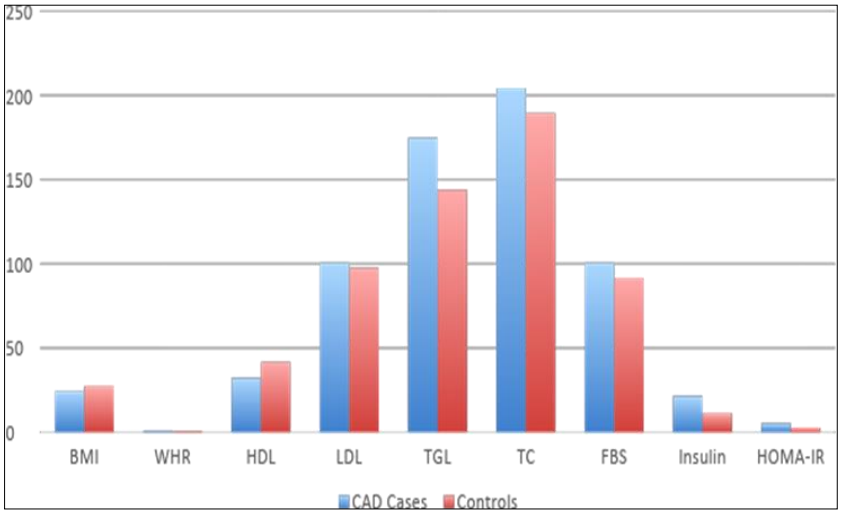
Parameter	Case	Control	p-value	Comment
HDL (mg/dL)	32.28 ± 3.7	41.66 ± 3.0	<0.01	Significant ↓ in cases
TGL (mg/dL)	174.86 ± 27.9	143.94 ± 23.7	<0.01	Significant ↑ in cases







HOMA IR vs CAD



Statistical summary

S.No	Parameter	p-value	Statistical Significance
1	Age	0.746	Not Significant
2	BMI	0.494	Not Significant
3	Waist–Hip Ratio	0.01	Significant ($p < 0.05$)
4	Systolic BP	0.767	Not Significant
5	Diastolic BP	0.737	Not Significant
6	HDL Cholesterol	0.01	Significant ($p < 0.05$)
7	Triglycerides (TGL)	0.01	Significant ($p < 0.05$)
8	Total Cholesterol (TC)	0.044	Significant ($p < 0.05$)
9	LDL Cholesterol	0.365	Not Significant
10	Fasting Blood Sugar (FBS)	0.01	Significant ($p < 0.05$)
11	Serum Insulin	0.01	Significant ($p < 0.05$)
12	HOMA-IR	0.01	Significant ($p < 0.05$)
13	Family History of CAD	0.035	Significant ($p < 0.05$)
14	Smoking	0.096	Not Significant
15	Alcohol	0.383	Not Significant
16	Gender	0.68	Not Significant

Discussion

- Insulin resistance plays an important role in promoting CAD and the degree of insulin resistance correlates with the severity of CAD.
- Insulin resistance has been considered to promote atherosclerosis by directly affecting blood vessels.
- ↓ Nitric oxide → endothelial dysfunction
- ↑ VCAM/ICAM → inflammation
- ↑ PAI-1 → thrombosis
- ↑ TG & ↓ HDL → atherogenic dyslipidemia
- Vascular smooth muscle proliferation
- Together → faster atherosclerosis.

- Several large scale studies have revealed that hyperinsulinemia is closely associated with the mortality due to cardiovascular disease.
- CAD patients had higher fasting insulin and HOMA-IR despite normal glycemia.
- Central obesity (↑WHR) correlated with IR, even with normal BMI.

- **Lipid profile:** ↑TGL, ↑TC, ↓HDL strongly associated with CAD.
- **Multivariate regression:** HOMA-IR independently associated with CAD (p=0.021).
- Hypertension is not a differentiating factor in this non diabetic CAD group.
- After controlling AGE, BMI,WHR,HDL,LDL,TGL,FBS, still CAD patients have 1.1 higher HOMA IR units than controls, independent of other factors.

Conclusion

- Insulin resistance is significantly higher in non-diabetic CAD patients.
- Insulin resistance alone may be considered an independent risk factor for CAD.
- HOMA-IR is a simple, effective screening tool for early risk detection.
- Screening for IR in all CAD patients and at risk individuals is necessary.
- Non-diabetic CAD patients should undergo IR assessment for early intervention."

Limitations & Future Scope

- Small sample size – larger multicentric studies needed.
- Single-time insulin measurement – no reproducibility check.
- Hospital-based sampling may not represent general population.

- Future: Evaluate inflammatory markers (adiponectin, IL-6, hsCRP) and genetic links to IR.

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