Endothelial Dysfunction and Cardiometabolic Risk Factors in Mexican American Adults: The Cameron County Hispanic Cohort

Enrique Garcia-Sayan, MD[a], Miryoung Lee, PhD[b], James R. Stone, MD[c], Danielle M. Stone, MD[c], Beverly Smulevitz, BS[c], David D. McPherson, MD[c], Susan P. Fisher-Hoch, MD[b], Joseph B. McCormick, MD[b], and Susan T. Laing, MD[c,*]

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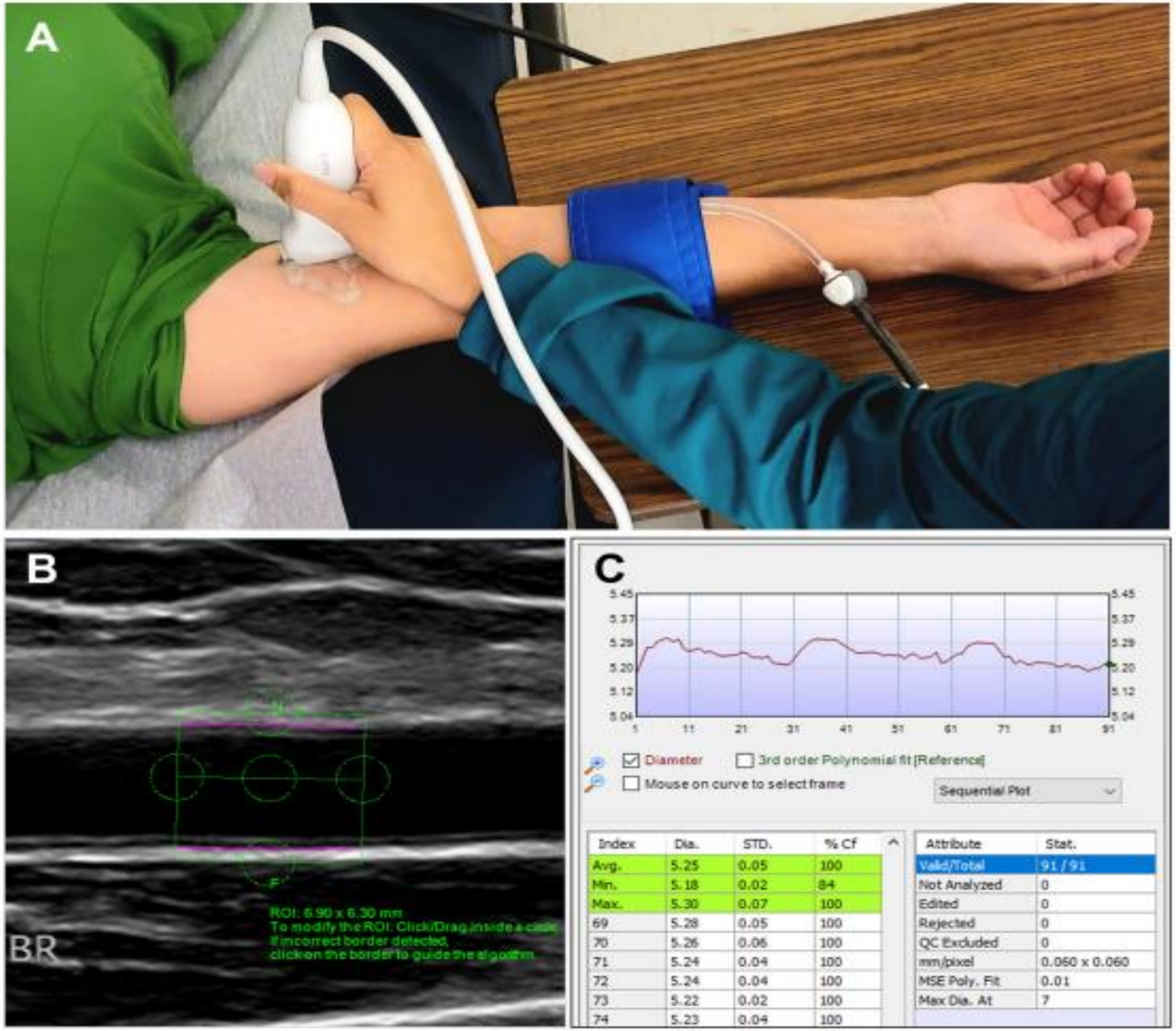
Background

- Brachial flow-mediated dilation (FMD) measures endothelial function mediated by nitric oxide release. Impaired brachial FMD is a prognostic factor in patients with established and predicts incident CVD in asymptomatic patients without known CVD
- This study aimed to assess the association of FMD and cardiometabolic risk factors in a population based sample composed of asymptomatic Mexican Americans without known CVD.



A
B
ROI: 6.90 x 6.30 mm
To modify the ROI: Click/Drag inside a circle
If incorrect border detected,
click on the border to guide the algorithm
BR
C
5.45
5.37
5.29
5.20
5.12
5.04
1
11
21
31
41
51
61
71
81
91
Diameter
3rd order Polynomial fit [Reference]
Mouse on curve to select frame
Sequential Plot
Index | Dia. | STD. | % Cf
Avg. | 5.25 | 0.05 | 100
Min. | 5.18 | 0.02 | 84
Max. | 5.30 | 0.07 | 100
69 | 5.28 | 0.05 | 100
70 | 5.26 | 0.06 | 100
71 | 5.24 | 0.04 | 100
72 | 5.24 | 0.04 | 100
73 | 5.22 | 0.02 | 100
74 | 5.23 | 0.04 | 100
Attribute | Stat.
Valid/Total | 91 / 91
Not Analyzed | 0
Edited | 0
Rejected | 0
QC Excluded | 0
mm/pixel | 0.060 x 0.060
MSE Poly. Fit | 0.01
Max Dia. At | 7

Data collection

- Study participants were recruited from randomly selected blocks in Brownsville (Cameron County, Texas), on the United States-Mexico border.
- 960 participants without known CVD.
- Anthropometric measurements :height, weight, and waist and hip circumference.
- Total body composition, Visceral adipose tissue (VAT).
- Subcutaneous adipose tissue (SAT).
- Hemoglobin HbA1c, fasting lipid panel, fasting plasma glucose, fasting serum insulin
- Physical activity, Fruit and vegetable consumption.
- Carotid ultrasound was performed to evaluate subclinical atherosclerosis.

- Participants were asked to fast for at least 8 hours before the ultrasound examination and took no vitamins or supplements or used tobacco-containing products in that time period.
- They also avoided significant exercise before the test and rested in a comfortable (supine) position for 15 minutes before the examination.
- Blood pressure was measured in both arms to exclude significant differences.

→A linear array transducer was used to image the brachial artery 6 cm above the right antecubital fossa before, 60 seconds, and 90 seconds after deflation of a right brachial cuff .

At least 3 consecutive cardiac cycles were analyzed using a semi-automated system, and diameters were determined from the media-adventitial interface at the near and far vessel walls.

The average diameter was calculated at baseline, 60, and 90 seconds (C)

- Gender-specific median values of FMD response were calculated, and participants were divided into 2 groups those with :

- high: > median FMD response

- low: ≤ median FMD response.

Results

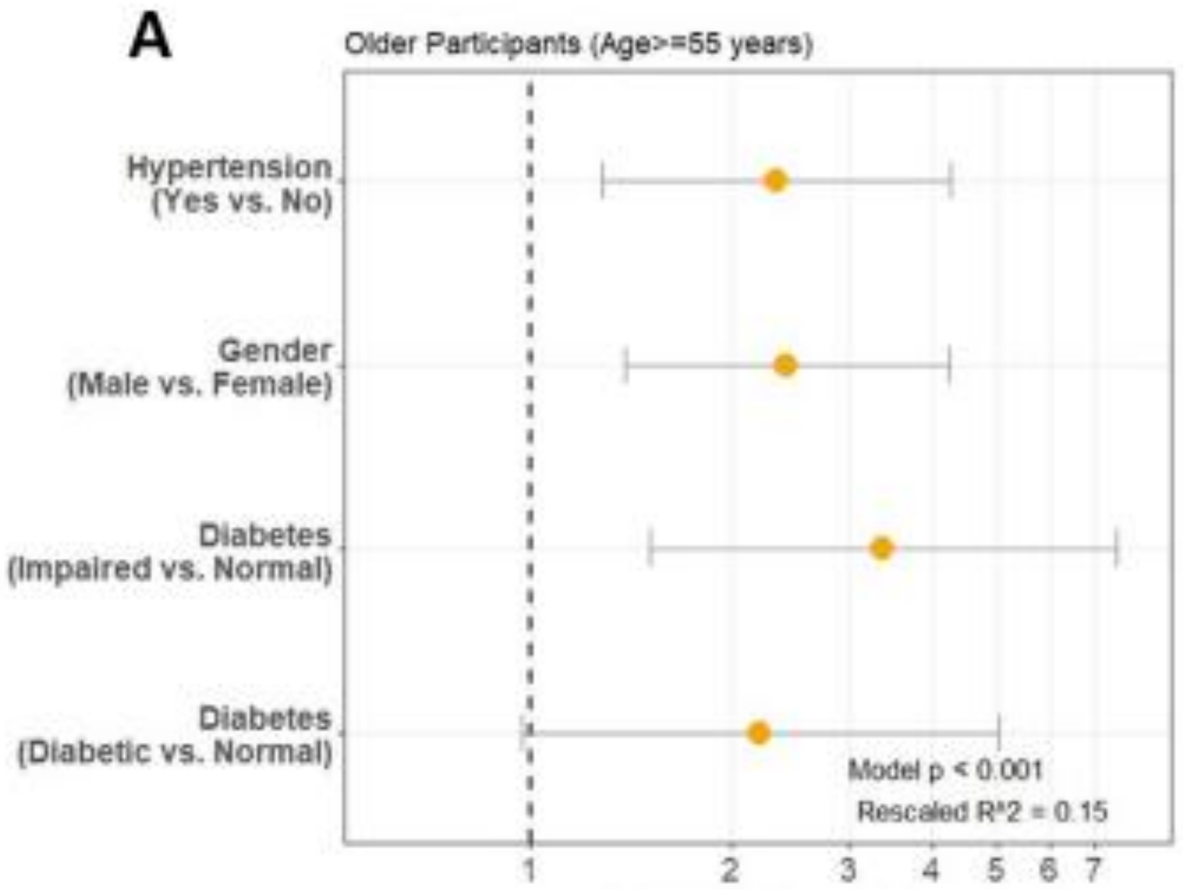
Demographic characteristics and risk factors of the study sample stratified by gender-specific median percent brachial flow-mediated dilation change from baseline.

Variable	N	Total	% FMD response Below median[1]	% FMD response Above median	p-value
		Mean (SE) or % (SE)	Mean (SE) or % (SE)	Mean (SE) or % (SE)	
Continuous variables, weighted mean (SE)					
Average brachial artery diameter (mm)	960	4.02 (0.04)	4.23 (0.07)	3.82 (0.04)	<0.001
FMD%	960	4.91 (0.30)	0.38 (0.31)	9.30 (0.25)	<0.001
Age (years)	960	52.08 (0.93)	53.76 (1.36)	50.45 (1.12)	0.054
Weight (kg)	958	79.70 (0.77)	80.02 (1.06)	79.40 (1.07)	0.671
Body Mass Index (kg/m^2)	958	30.49 (0.26)	30.61 (0.39)	30.36 (0.33)	0.615
Waist Circumference (cm)	958	102.50 (0.66)	103.2 (0.91)	101.81 (0.92)	0.273
Hip Circumference (cm)	958	108.93 (0.52)	109.08 (0.71)	108.77 (0.74)	0.759
Waist-to-hip ratio	958	0.94 (0.00)	0.94 (0)	0.94 (0.01)	0.217
VAT volume	664	927.91 (29.36)	991.21 (43.69)	856.33 (32.53)	0.013
SAT volume	664	1807.48 (33.36)	1801.98 (48.05)	1813.7 (46.79)	0.863
VAT to SAT ratio	664	0.54 (0.02)	0.57 (0.02)	0.50 (0.02)	0.015
SBP (mm Hg)	954	120.22 (0.88)	121.87 (1.2)	118.64 (1.14)	0.044
DBP (mm Hg)	954	72.36 (0.48)	72.91 (0.72)	71.82 (0.6)	0.237
Fasting Glucose (mg/dL)	952	110.84 (2.18)	116.32 (3.45)	105.44 (2.39)	0.009
Hemoglobin A1C, %	954	6.23 (0.07)	6.39 (0.11)	6.08 (0.08)	0.026
Insulin Level (mU/L)	890	12.14 (0.38)	12.35 (0.58)	11.94 (0.47)	0.562
HOMA-IR	884	3.32 (0.12)	3.55 (0.20)	3.10 (0.13)	0.055
Total cholesterol (mg/dL)	955	184.99 (1.83)	187.86 (2.74)	182.2 (2.38)	0.119
Triglycerides (mg/dL)	955	147.00 (4.44)	156.69 (7.67)	137.61 (4.2)	0.030
High-Density Lipoprotein (mg/dL)	954	48.39 (0.67)	47.15 (0.85)	49.59 (0.95)	0.050
Low-Density Lipoprotein (mg/dL)	942	107.16 (1.53)	110.01 (2.21)	104.43 (2.16)	0.076
WBC	950	6.67 (0.08)	6.72 (0.12)	6.62 (0.12)	0.533
cIMT (mm)	559	0.73 (0.02)	0.77 (0.03)	0.70 (0.01)	0.022
Education Level (years)	947	12.13 (0.35)	11.77 (0.52)	12.47 (0.46)	0.301

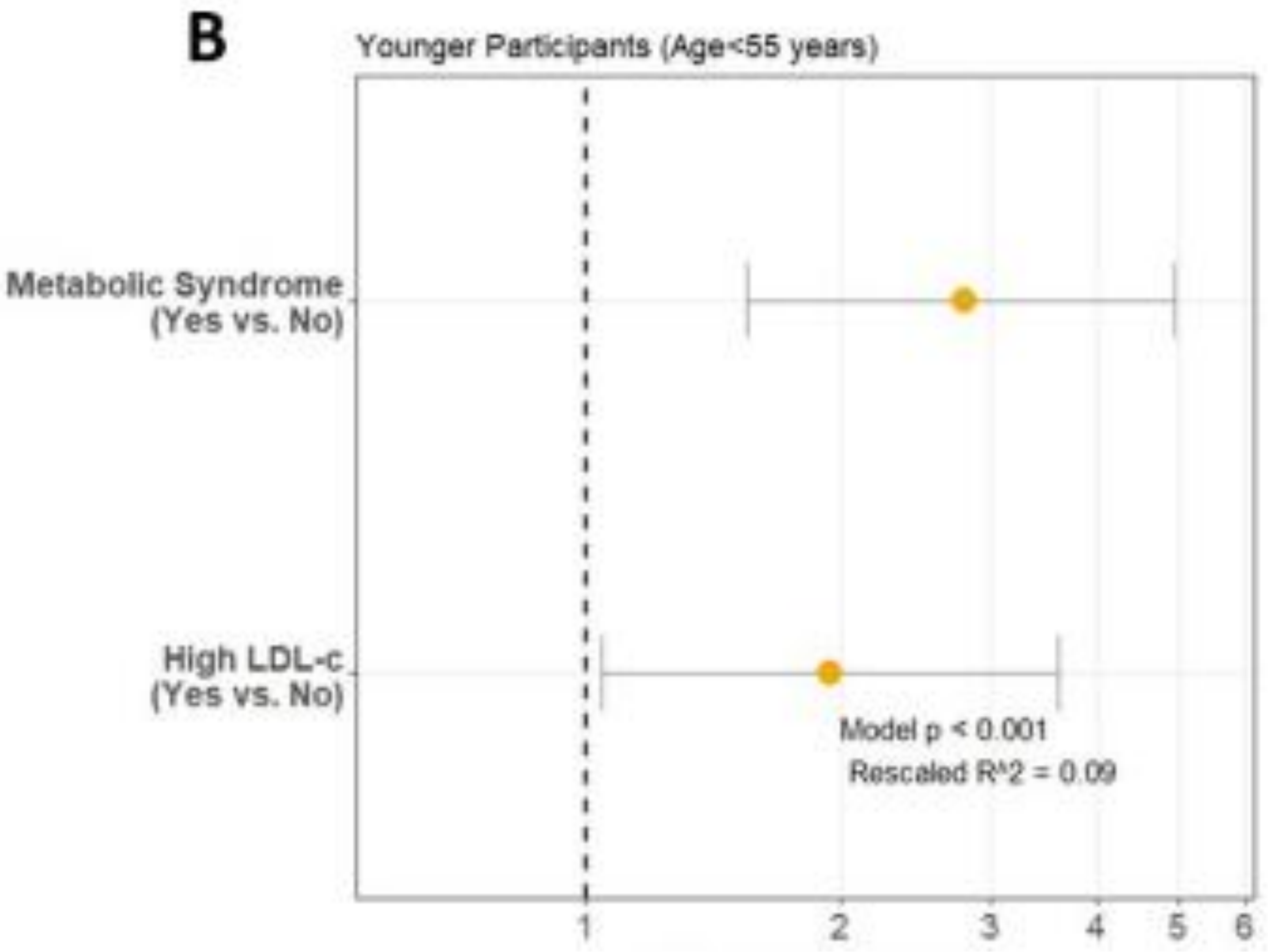
Categorical Variables Weighted frequency (%, SE)					
Male	309	42.06 (2.29)	46.49 (3.51)	37.76 (3.07)	0.066
Female	651	57.94 (2.29)	53.51 (3.51)	62.24 (3.07)	
< high school education (Yes)	947	42.34 (2.65)	53.75 (3.60)	61.44 (3.57)	0.114
Born in the US (No)	946	64.08 (2.74)	63.94 (3.91)	64.22 (3.70)	0.957
Health insurance (No)	945	45.47 (2.72)	46.87 (3.6)	44.09 (3.61)	0.558
Smoker (>100 cigarettes in a lifetime)	941	34.87 (2.28)	37.13 (3.55)	32.68 (3.11)	0.361
Physical activity	830				0.476
Sedentary		68.72 (2.36)	71.23 (3.25)	66.44 (3.46)	
Low activity		5.92 (0.96)	5.72 (1.45)	6.11 (1.27)	
Moderate activity		12.54 (1.62)	12.85 (2.54)	12.27 (1.95)	
High activity		12.81 (1.95)	10.20 (2.17)	15.19 (3.15)	
Meet fruit & vegetable guidelines (No)	831	88.43 (2.05)	89.88 (3.29)	87.12 (2.55)	0.524
Abnormal Waist Circumference[†] (Yes)	958	71.10 (2.40)	70.75 (3.54)	71.43 (3.09)	0.883
Obesity[‡]	958				0.379
Normal BMI		15.10 (2.02)	16.75 (3.25)	13.49 (2.23)	
Overweight		35.78 (2.37)	32.56 (3.37)	38.91 (3.4)	
Obese		49.12 (2.52)	50.69 (3.74)	47.59 (3.39)	
Hypertension[§] (Yes)	954	47.78 (2.62)	55.34 (3.56)	40.50 (3.46)	0.002
High total cholesterol[¶] (Yes)	955	46.74 (2.69)	49.93 (3.74)	43.65 (3.77)	0.232
High Triglycerides ** (Yes)	955	48.76 (2.45)	52.70 (3.65)	44.94 (3.35)	0.122
Low HDL-C[††] (Yes)	954	44.16 (2.63)	44.92 (3.64)	43.41 (3.69)	0.768
High LDL-C[‡‡] (Yes)	945	22.66 (2.26)	26.03 (3.71)	19.41 (2.50)	0.123
On any lipid-lowering medication (Yes)	960	16.81 (1.67)	15.12 (2.11)	18.45 (2.62)	0.324
Having carotid plaque (Yes)	564	21.78 (3.06)	26.73 (4.8)	16.82 (3.25)	0.063
cIMT > 75th %tile (Yes)	523	34.98 (3.58)	37.23 (5.31)	32.74 (4.15)	0.473
Diabetes Mellitus[§§]	951				0.089
Normal		30.01 (2.32)	25.58 (2.84)	34.33 (3.37)	
Impaired (or pre-DM)		43.85 (2.71)	44.71 (3.74)	43.00 (3.77)	
DM		26.14 (2.09)	29.70 (2.99)	22.67 (2.88)	
Metabolic syndrome (Yes)	956	38.21 (2.50)	44.76 (3.74)	31.89 (3.21)	0.009

- The low %FMD group was significantly older, had higher visceral adipose tissue, systolic blood pressure, or plasma glucose, and had metabolic syndrome compared with those in the high %FMD group.

- Multivariable-adjusted age-stratified logistic regression analyses showed that in older participants, male gender (odds ratio [OR] = 2.4 [1.4 to 4.2]) and having hypertension(OR = 2.3 [1.3 to 4.3]) or prediabetes mellitus (OR = 3.4 [1.5 to 7.5]) remained significantly associated with odds of low %FMD.
- In younger participants, high low-density lipoprotein (OR = 2.8 [1.6 to 4.9]) or having the metabolic syndrome (OR = 1.9 [1.1 to 3.6]) were significantly associated with odds of low %FMD.



- Survey-weighted multivariable adjusted logistic regression analyses showed that in participants > 55 years old;
 male gender, and having hypertension or prediabetes remained significantly associated with an FMD response below the gender-specific median.



- whereas in those younger than 55 years, a high LDL-cholesterol or having the metabolic syndrome are significantly associated with an FMD response below the gender-specific median (B)

Conclusion

- In conclusion, our study identified age-dependent associations between cardiometabolic biomarkers and visceral obesity and an FMD response below the gender-specific median in Mexican Americans without established CVD but with a high prevalence of risk factors.
- Although the progression from endothelial dysfunction to atherosclerosis is complex, targeting specific risk factors by age may mitigate the progression to incident CVD in this high-risk group.