

## AIP and arterial stiffness in elderly

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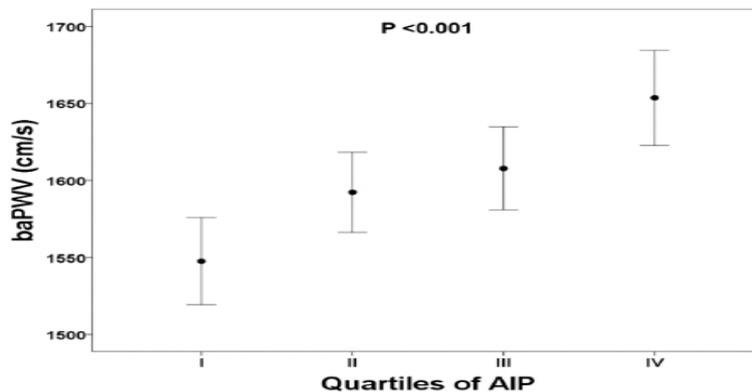
**Background:** The atherogenic index of plasma (AIP) has been suggested as a novel marker for atherosclerosis. However, data on the association of AIP with subclinical atherosclerosis beyond traditional risk factors in the elderly population has been limited.

**Methods:** We investigated the relation between AIP and arterial stiffness using brachial-ankle pulse wave velocity (baPWV) in asymptomatic 1,141 Korean adults aged  $\geq 60$  years. All participants were stratified into four groups based on AIP quartiles. AIP was calculated as the base 10 logarithm of the serum concentration ratio of the triglycerides to high-density lipoprotein cholesterol. Hypertension, diabetes mellitus, hyperlipidemia, obesity, and smoking were considered as traditional risk factors.

**Results:** The overall prevalence of hypertension, diabetes mellitus, hyperlipidemia, obesity, and smoking was 58.9%, 19.8%, 37.0%, 48.1%, and 29.4%, respectively; the prevalence of traditional risk factors, except hyperlipidemia, were significantly increased with elevating AIP quartiles. The levels of baPWV (cm/s) were significantly different according to the AIP quartiles (group I [lowest]:  $1547.6 \pm 255.0$  vs. group II:  $1592.4 \pm 245.5$  vs. group III:  $1607.8 \pm 260.9$  vs. group IV [highest]  $1653.6 \pm 288.7$ ;  $P < 0.001$ ). In the univariate linear regression analysis, AIP (per 0.1-increase) was positively associated with baPWV ( $\beta = 14.362$ ;  $P < 0.001$ ). Multiple linear regression models showed that the association of AIP with baPWV was consistent after adjusting for age, sex, and traditional risk factors ( $\beta = 11.070$ ;  $P < 0.001$ ).

**Conclusions:** High AIP levels are independently associated with an increase of arterial stiffness in asymptomatic elderly Koreans beyond traditional risk factors. Keywords: atherogenic index of plasma, arterial stiffness, subclinical atherosclerosis, elderly

Figure 1. Comparison of baPWV according to AIP quartiles



Characteristics	n = 1,411
Age, yr	66.2 ± 4.4
Men, n (%)	492 (34.9)
BMI, kg/m <sup>2</sup>	25.9 ± 3.8
Obesity, n (%)	679 (48.1)
Systolic BP, mmHg	124.9 ± 15.1
Diastolic BP, mmHg	74.2 ± 9.4
Heart rate, bpm	66.9 ± 9.8
Hypertension, n (%)	831 (58.9)
Anti-hypertensive treatment, n (%)	744 (52.7)
Diabetes mellitus, n (%)	279 (19.8)
Anti-diabetic treatment, n (%)	247 (17.5)
Hyperlipidemia, n (%)	522 (37.0)
Anti-hyperlipidemic treatment, n (%)	421 (29.8)
Smoking, n (%)	415 (29.4)
Total cholesterol, mg/dL	198.9 ± 36.2
Triglyceride, mg/dL	129.3 ± 65.0
HDL-C, mg/dL	53.7 ± 14.5
LDL-C, mg/dL	119.9 ± 32.8
Fasting glucose, mg/dL	102.6 ± 21.2
Creatinine, mg/dL	0.80 ± 0.20
AIP	0.35 ± 0.27

Values are given as mean ± standard deviation or number (%).  
AIP = atherogenic index of plasma; BMI = body mass index; BP = blood pressure; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.

Table 2. Prevalence of traditional risk factors according to AIP quartiles

	Quartiles of AIP				P
	I (lowest) (n = 326) -0.432 to 0.140	II (n = 358) 0.141-0.324	III (n = 376) 0.325-0.534	IV (highest) (n = 351) 0.535-1.409	
Hypertension, n (%)	159 (48.8)	203 (56.7)	237 (63.0)	232 (66.1)	<0.001
Diabetes mellitus, n (%)	48 (14.7)	65 (18.2)	90 (23.9)	76 (21.7)	0.013
Hyperlipidemia, n (%)	119 (36.5)	138 (38.5)	153 (40.7)	112 (31.9)	0.090
Obesity, n (%)	110 (33.7)	169 (47.2)	202 (53.7)	198 (56.4)	<0.001
Smoking, n (%)	73 (22.4)	88 (24.6)	125 (33.2)	129 (36.8)	<0.001

Values are given as number (%).  
AIP = atherogenic index of plasma.

Table 3. Association between clinical variables and baPWV

	baPWV		
	$\beta$ (95% CI)	SE	P
Age, per 1-year	19.297 (16.279-22.315)	1.538	<0.001
Male	62.089 (33.176-91.000)	14.738	<0.001
Systolic BP, per 1-mmHg increase	10.152 (9.404-10.900)	0.381	<0.001
Diastolic BP, per 1-mmHg increase	11.908 (10.570-13.274)	0.682	<0.001
BMI, per 1-kg/m <sup>2</sup> increase	2.104 (-2.546-6.754)	2.370	0.375
Total cholesterol, per 1-mg/dL increase	-0.206 (-0.589-0.176)	0.195	0.291
Triglyceride, per 1-mg/dL increase	0.461 (0.249-0.673)	0.108	<0.001
HDL-C, per 1-mg/dL increase	-2.315 (-3.256- -1.365)	0.484	<0.001
LDL-C, per 1-mg/dL increase	-0.103 (-0.526-0.321)	0.216	0.635
Glucose, per 1-mg/dL increase	2.042 (1.396-2.688)	0.329	<0.001
AIP, per 0.1-increase	14.362 (9.293-19.431)	2.584	<0.001
Smoking	52.079 (21.774-82.385)	15.449	0.001

AIP = atherogenic index of plasma; baPWV = brachial-ankle pulse wave velocity; BMI = body mass index; BP = blood pressure; CI = confidence interval; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.

Table 4. Multiple linear regression models for the association of AIP (per 0.1-unit increase) with baPWV

	baPWV		
	B (95% CI)	SE	P value
Model 1	13.977 (9.132-18.821)	2.470	<0.001
Model 2	10.620 (5.867-15.372)	2.423	<0.001
Model 3	11.070 (6.252-15.888)	2.456	<0.001

AIP = atherogenic index of plasma; baPWV = brachial-ankle pulse wave velocity; CI = confidence interval

Model 1 = adjusted for age and sex; Model 2 = adjusted for age, sex, hypertension, diabetes mellitus, and hyperlipidemia; Model 3 = adjusted for age, sex, hypertension, diabetes mellitus, hyperlipidemia, obesity, and smoking