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Table 1. Characteristics of The Study Population

	Men (n = 299)	Women (n = 401)	<i>p</i> -value
	Mean (SD)		
Age (years)	67.9 (8.3)	67.5 (7.6)	0.521
Height (cm)	163.4 (6.5)	151.6 (5.6)	< 0.001
Weight (kg)	62.4 (10.0)	51.3 (7.8)	< 0.001
BMI (kg/m <sup>2</sup> )	23.3 (2.9)	22.3 (3.1)	< 0.001
BUA (dB/MHz)	108.9 (13.9)	92.9 (12.2)	< 0.001
SOS (m/sec)	1542.2 (29.9)	1524 (25.2)	< 0.001
Stiffness index	84.3 (16.2)	68.6 (13.4)	< 0.001
	Median [Q1 - Q3]		
25(OH)D (ng/ml)	26.0 [20 – 30]	20.0 [16 – 24]	< 0.001
log(25(OH)D)	3.2 (0.2)	3.0 (0.3)	< 0.001
	n (%)		
Exercise (yes)	94 (31.4)	140 (34.9)	0.335
Current smoking (yes)	51 (17.1)	5 (1.3)	< 0.001
Alcohol drinking (yes)	19 (6.4)	6 (1.5)	< 0.001

SD: standard deviation, BMI: body mass index, BUA: broadband ultrasound attenuation, SOS: speed of sound, 25(OH)D: 25-hydroxyvitamin D

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5 Table 2. Mean of BUA, SOS, Stiffness Index and 25(OH)D by Age Groups

Age (years)	50 - 59	60 - 69	70 - 79	80 -	<i>p</i> - value	<i>p</i> for trend
	Mean (SD)					
Men	(n=43)	(n=132)	(n=102)	(n=22)		
BUA (dB/MHz)	111.1 (11.1)	111.5 (13.2)	106.7 (14.8)	98.6 (13.6)	< 0.001	< 0.001
SOS (m/sec)	1546.6 (25.9)	1545.5 (30.5)	1540.0 (31.2)	1523.5 (19.8)	0.008	0.006
Stiffness index	87.0 (12.4)	87.0 (15.6)	82.3 (17.7)	72.2 (13.9)	< 0.001	< 0.001
25(OH)D (ng/ml)	26.3 (6.6)	26.3 (5.8)	26.1 (5.5)	23.2 (5.3)	0.151	0.101
Women	(n=68)	(n=167)	(n=142)	(n=24)		
BUA (dB/MHz)	97.9 (12.6)	95.6 (11.9)	88.6 (11.0)	85.1 (8.2)	< 0.001	< 0.001
SOS (m/sec)	1534.8 (22.3)	1528.2 (23.9)	1517.0 (25.4)	1505.6 (19.4)	< 0.001	< 0.001
Stiffness index	74.9 (12.8)	71.6 (12.7)	63.8 (12.5)	58.3 (9.0)	< 0.001	< 0.001
25(OH)D (ng/ml)	19.6 (6.5)	20.1 (5.1)	20.0 (5.5)	17.6 (4.7)	0.056	0.346

6 SD: standard deviation, BUA: broadband ultrasound attenuation, SOS: speed of sound, BMI: body  
7 mass index, 25(OH)D: 25-hydroxyvitamin D  
8 *p*-value: One-way ANOVA, *p* for trend: Jonckheere-Terpstra trend test

Table 3. Simple Correlation Coefficients Between BUA, SOS or Stiffness Index and Age, BMI or Log(25(OH)D)

	men (n = 299)		women (n = 401)	
	r	p	r	p
BUA				
Age (years)	- 0.23	< 0.001	- 0.34	< 0.001
BMI (kg/m <sup>2</sup> )	0.11	0.065	0.18	< 0.001
log(25(OH)D)	0.09	0.107	0.07	0.148
SOS				
Age (years)	- 0.18	0.002	- 0.35	< 0.001
BMI (kg/m <sup>2</sup> )	0.03	0.625	- 0.06	0.262
log(25(OH)D)	0.07	0.262	0.13	0.012
Stiffness index				
Age (years)	- 0.23	< 0.001	- 0.39	< 0.001
BMI (kg/m <sup>2</sup> )	0.08	0.193	0.08	0.102
log(25(OH)D)	0.09	0.135	0.11	0.028

SD: standard deviation, BUA: broadband ultrasound attenuation, SOS: speed of sound, BMI: body mass index, 25(OH)D: 25-hydroxyvitamin D

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Table 4. Comparison Between Vitamin D Status and BUA, SOS and Stiffness Index

		Vitamin D (ng/ml)			<i>p</i> for trend
		< 20	20 ≤, < 30	30 ≤	
		Mean (SD)			
Men	n	(n = 45)	(n = 170)	(n = 84)	
	BUA (dB/MHz)	106.0 (2.1)	108.6 (1.1)	111.0 (1.5)	0.060
	SOS (m/sec)	1537.3 (4.5)	1542.5 (2.3)	1544.2 (3.3)	0.245
	Stiffness index	81.0 (2.4)	84.2 (1.2)	86.2 (1.8)	0.093
Women	n	(n = 211)	(n = 172)	(n = 18)	
	BUA (dB/MHz)	92.0 (0.8)	93.7 (0.9)	94.6 (2.9)	0.117
	SOS (m/sec)	1520.7 (1.7)	1527.4 (1.9)	1529.5 (5.9)	0.038
	Stiffness index	67.1 (0.9)	70.1 (1.0)	71.3 (3.1)	0.044

SD: standard deviation, BUA: broadband ultrasound attenuation, SOS: speed of sound

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Table 5. Multiple Regression Analysis Between 25(OH)D and BUA, SOS, and Stiffness Index

	men (n = 299)			women (n = 401)		
	estimate	SE	p - value	estimate	SE	p - value
	BUA (dB/MHz)					
log(25(OH)D)	3.96	3.21	0.218	2.68	1.98	0.176
Covariates						
Age (years)	- 0.45	0.10	< 0.001	- 0.58	0.07	< 0.001
BMI (kg/m <sup>2</sup> )	0.15	0.27	0.578	0.82	0.18	< 0.001
Exercise (yes)	2.21	1.69	0.192	3.46	1.17	0.003
Current smoking (yes)	- 5.24	2.15	0.015	- 5.42	5.10	0.288
Alcohol drinking (yes)	- 2.24	3.29	0.496	- 8.20	4.64	0.078
	SOS (m/sec)					
log(25(OH)D)	5.64	6.99	0.420	10.60	4.16	0.011
Covariates						
Age (years)	- 0.81	0.22	< 0.001	- 1.18	0.15	< 0.001
BMI (kg/m <sup>2</sup> )	- 0.32	0.60	0.591	- 0.28	0.38	0.463
Exercise (yes)	6.83	3.68	0.064	5.52	2.47	0.026
Current smoking (yes)	- 7.45	4.68	0.112	- 4.93	10.72	0.646
Alcohol drinking (yes)	- 8.81	7.17	0.220	- 11.61	9.77	0.235
	Stiffness index					
log(25(OH)D)	4.20	3.74	0.262	4.73	2.15	0.028
Covariates						
Age (years)	- 0.52	0.12	< 0.001	- 0.72	0.08	< 0.001
BMI (kg/m <sup>2</sup> )	0.01	0.32	0.969	0.47	0.20	0.018
Exercise (yes)	3.37	1.97	0.088	3.84	1.28	0.003
Current smoking (yes)	- 5.56	2.51	0.027	- 4.98	5.54	0.369
Alcohol drinking (yes)	- 3.94	3.84	0.305	- 8.69	5.05	0.086

SE: standard error, BUA: broadband ultrasound attenuation, SOS: speed of sound, 25(OH)D: 25-hydroxyvitamin D, BMI: body mass index