

Central Obesity And Fat-Free Mass Are Associated With A Larger Spleen Volume In The General Population

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CONTENT

- 1. Objectives
- 2. Materials and Methods
- 3. Results
- 4. Conclusions
- 5. Figures

1. Objectives

Investigate associations between body composition markers and spleen volume in the general population.

2. Materials and Methods

❖ Population

- **Study:** START-2
- **Participants:** 2,333 individuals
- **Analysis:** 1,091 individuals (566 women; 52%) considered for present analysis.

❖ Exposures:

- Body composition markers from
 - Classic anthropometry
- Bioelectrical impedance analysis (BIA);
 - Absolute fat mass and fat-free mass
- Magnetic resonance imaging (MRI):
 - Visceral adipose tissue, subcutaneous adipose tissue, and liver fat content.

❖ Outcomes:

- MRI assessed Spleen volume.

❖ Regression Models

- Models stratified by age, sex, smoking, and physical inactivity.

3. Results

❖ Associations with Spleen Volume

- **Stronger associations observed in men for:**
 - Body mass index
 - Body weight
 - Waist circumference
 - Hip circumference
 - Waist-to-height ratio
 - Absolute fat mass and subcutaneous adipose tissue
- **Stronger associations in women for**
 - Absolute fat-free mass and visceral adipose tissue

❖ Table 1: Characteristics of study population

- Stratified by quartiles of waist circumference (n=1,091).

Parameter	First quartile N=(277)	Second quartile N=(268)	Third quartile N=(273)	Fourth quartile N=(273)
Age in years	48.0 (41.0 , 60.0)	56.0 (43.0 , 64.5)	58.0 (47.0 , 68.0)	60.0 (52.0 , 67.0)
Sex				
Men (%)	9.4	47.4	60.1	76.5
Women (%)	90.6	52.6	39.9	23.5
Body mass index in kg/m ²	23.2 (21.6 , 24.7)	25.8 (24.8 , 27.5)	28.4 (26.6 , 30.3)	31.6 (29.9 , 34.5)
Body weight in kg	62.3 (58 , 68.2)	74.8 (70.7 , 79.6)	82.5 (76.9 , 88.7)	96.5 (89.3 , 104)
Body height in cm	164 (160 , 169)	170 (163 , 176)	171 (163 , 177)	175 (168 , 180)
Waist circumference in cm	75.0 (71.0 ; 77.5)	86.0 (83.2; 88.1)	95.0 (92.5; 97.5)	106 (102; 111)
Hip circumference in cm	93.7 (89.4 , 97.0)	98.1 (94.5 , 103)	102 (98.4 , 107)	108 (104 , 115)
Waist-to-hip ratio	0.79 (0.76 , 0.83)	0.88 (0.83 , 0.91)	0.92 (0.88 , 0.96)	0.98 (0.94 , 1.01)
Waist-to-height ratio	0.45 (0.43 , 0.47)	0.51 (0.49 , 0.52)	0.55 (0.53 , 0.58)	0.61 (0.59 , 0.64)
Absolute Fat mass in kg	17.4 (14.1 , 20.7)	20.6 (15.9 , 26.1)	22.7 (18.9 , 28.7)	28.2 (23.3 , 34.8)
Absolute Fat-free mass in kg	44.6 (42.2 , 47.3)	53.2 (47.5 , 61.0)	58.2 (51.3 , 66.0)	68.6 (60.2 , 74.3)
Visceral adipose tissue in L	1.46 (0.98 , 2.01)	3.28 (2.42 , 4.10)	4.85 (4.01 , 5.98)	7.21 (5.98 , 8.59)
Sub-cutaneous adipose tissue in L	5.76 (4.42 , 6.98)	6.49 (4.66 , 8.98)	7.14 (5.66 , 9.97)	9.27 (7.49 , 12.0)
Liver fat contents in %	2.57 (2.04 , 3.39)	3.55 (2.69 , 5.23)	5.95 (3.53 , 11.4)	9.20 (5.61 , 16.9)
Spleen volume in mL	1.44 (1.11 , 1.83)	1.75 (1.34 , 2.19)	1.87 (1.45 , 2.42)	2.18 (1.74 , 2.84)
Estimated blood volume in mL	3822 (3573 ; 4138)	4638 (4153 ; 5054)	4980 (4499 ; 5395)	5656 (5186 ; 6021)
Sedentary lifestyle in %	23.6%	28.7%	28.8%	36.1%
Hypertension in %	23.7%	40.0%	62.1%	79.1%

❖ Table 2: Adjusted β -coefficient (95%-CI)

- Associations of standardized body composition markers with spleen volume.

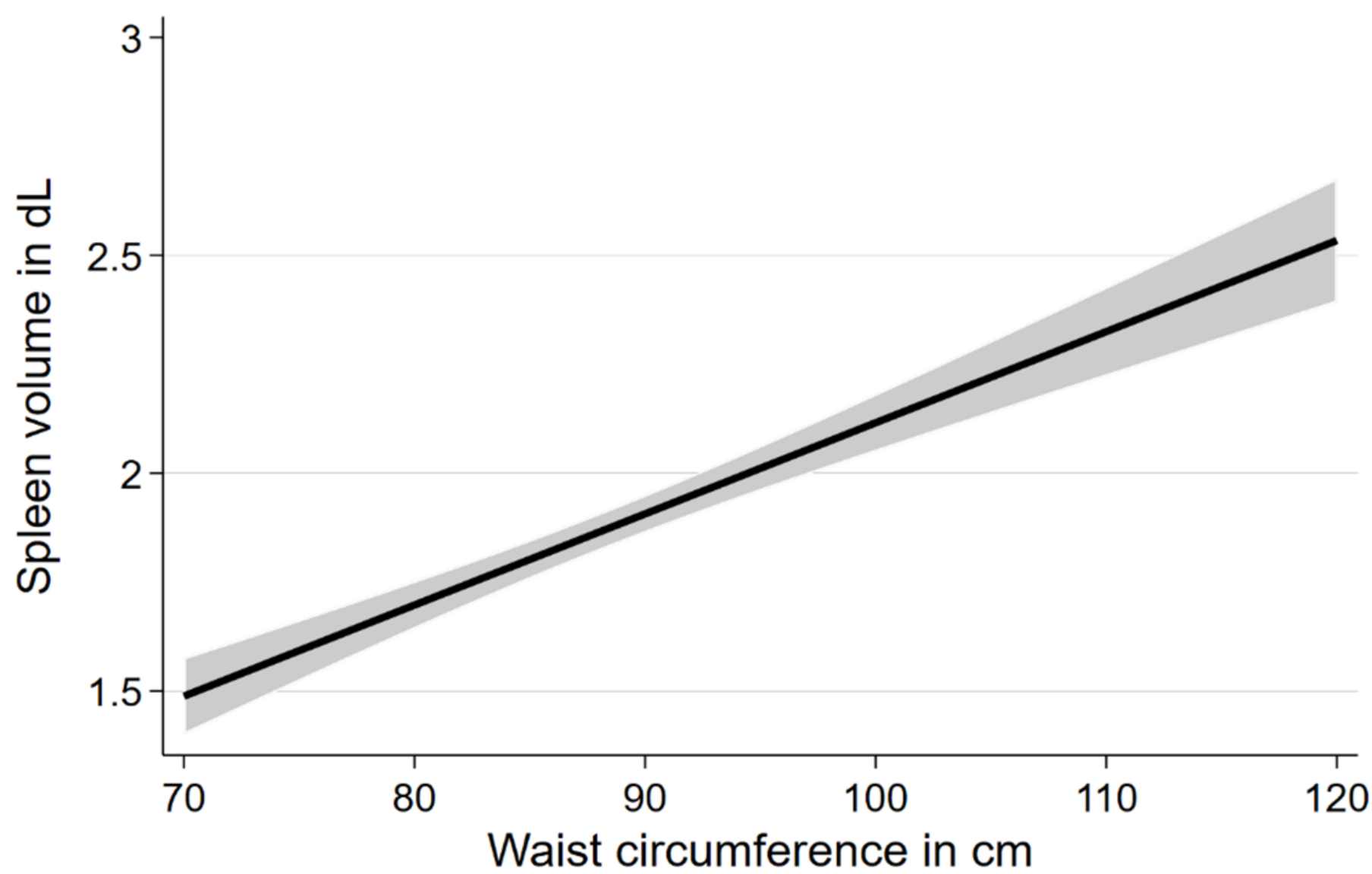
	Men		Women	
	β (95% CI)	p	β (95% CI)	p
Body mass index ; SD	0.30 (0.22; 0.39)	<0.001	0.19 (0.15; 0.24)	<0.001
Body weight; SD	0.33 (0.24; 0.42)	<0.001	0.25 (0.19; 0.30)	<0.001
Body height; SD	0.22 (0.11; 0.33)	<0.001	0.16 (0.09; 0.24)	<0.001
Waist circumference; SD	0.29 (0.20; 0.38)	<0.001	0.22 (0.16; 0.28)	<0.001
Hip circumference ; SD	0.31 (0.22; 0.39)	<0.001	0.18 (0.13; 0.22)	<0.001
Waist to hip ratio; SD	0.22 (0.12; 0.32)	<0.001	0.17 (0.09; 0.25)	<0.001
Waist to height ratio; SD	0.27 (0.18; 0.36)	<0.001	0.17 (0.11; 0.22)	<0.001
Absolute Fat mass; SD	0.24 (0.15; 0.32)	<0.001	0.19 (0.15; 0.24)	<0.001
Absolute Fat-free mass ; SD	0.38 (0.27; 0.50)	<0.001	0.42 (0.26; 0.59)	<0.001
Visceral adipose tissue ; SD	0.14 (0.07; 0.22)	<0.001	0.22 (0.14; 0.31)	<0.001
Sub-cutaneous adipose tissue; SD	0.21 (0.12; 0.29)	<0.001	0.13 (0.09; 0.18)	<0.001
Liver fat contents; SD	0.16 (0.09; 0.24)	<0.001	0.11 (0.06; 0.18)	<0.001

4. Conclusions

- Obesity-related markers and fat-free mass associated with spleen volume.
- Particularly, higher absolute fat-free mass shows a strong association, possibly mediated through higher total blood volume, in both men and women.

5. Figures

❖ Figure 1: Associations of waist circumference with spleen volume.



❖ Figure 2: Associations of absolute fat-free mass with spleen volume.

