

Low total and free triiodothyronine levels are associated with insulin resistance in non-diabetic individuals

Short title: Thyroid hormones and insulin resistance

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Supplemental Table 1. Relations between subject characteristics and insulin resistance

Variables	Univariate
	Coefficient (95% CI)
Demographic data	
Age	
20-40 years	Reference
41-60 years	0.163 (-0.164, 0.490)
≥ 61 years	0.143 (-0.123, 0.410)
Sex	
Female	Reference
Male	0.240 (-0.042, 0.522)
Race	
Non-Hispanic white	Reference
Non-Hispanic black	0.061 (-0.394, 0.517)
Mexican American	0.818 (0.467, 1.169)
Other Hispanic	0.533 (-0.243, 1.308)
Other race	0.107 (-0.494, 0.708)
Comorbidities	
Liver function	
Normal	Reference
Poor	1.320 (0.854, 1.785)
Chronic kidney disease	
No, eGFR ≥ 60 (mL/min/1.73m ²)	Reference
Yes, eGFR < 60 (mL/min/1.73m ²)	-0.222 (-0.546, 0.102)
Cardiovascular disease	
No	Reference
Yes	0.403 (-0.011, 0.816)
Depression	
No	Reference
Yes	0.594 (-0.179, 1.367)
Obesity	
No	Reference
Yes	2.076 (1.750, 2.403)
Hypertension	
No	Reference
Yes	1.020 (0.670, 1.370)
Dyslipidemia	
No	Reference
Yes	0.738 (0.454, 1.022)
Health behavior	

Smoking	
Never	Reference
Former	0.050 (-0.174, 0.275)
Current	-0.278 (-0.550, -0.005)
Alcohol consumption	
Never	Reference
Former drinker	0.297 (-0.227, 0.821)
Current drinker	0.053 (-0.224, 0.330)
Physical activity	
Metabolic equivalent of task \geq 600	Reference
Metabolic equivalent of task $<$ 600	0.590 (0.237, 0.942)
Vigorous recreational activity	
No	Reference
Yes	-0.622 (-0.850, -0.394)
Moderate recreational activity	
No	Reference
Yes	-0.339 (-0.697, 0.018)
Laboratory studies	
Two Hour Glucose (mmol/L)	0.290 (0.224, 0.357)
Glycohemoglobin (%)	
$<$ 5.5	Reference
5.5-6.4	0.807 (0.507, 1.107)
\geq 6.5	0.762 (-0.324, 1.847)
High-density lipoprotein (mmol/L)	-1.790 (-2.280, -1.301)
Triglyceride (mmol/L)	0.481 (0.261, 0.701)
Serum vitamin D	
Normal ($>$ 75 nmol/L)	Reference
Insufficiency (50 – 75 nmol/L)	0.689 (0.203, 1.175)
Deficiency ($<$ 50 nmol/L)	1.000 (0.442, 1.558)
C-reactive protein (mg/dL)	1.016 (0.507, 1.525)

CI, confidence interval; eGFR, estimated glomerular filtration rate.
 Bold indicates significant factor, $p < 0.05$.

Supplemental Table 2. Relations between thyroid hormone levels and insulin resistance adjusting for different factors.

	Model 1	Model 2	Model 3
	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Thyroid stimulating hormone (TSH) (mIU/L)			
Normal (0.24-5.4 mIU/L)	Reference	Reference	Reference
Low (< 0.24 mIU/L)	-0.542 (-1.191, 0.107)	-0.663 (-1.170, -0.156)	-0.593 (-1.091, -0.095)
High (> 5.4 mIU/L)	0.159 (-0.598, 0.916)	0.306 (-0.361, 0.973)	0.376 (-0.288, 1.040)
Total triiodothyronine (TT3) (ng/dL)			
Normal (87-178 ng/dL)	Reference	Reference	Reference
Low (< 87 ng/dL)	-0.745 (-1.210, -0.281)	-0.470 (-0.903, -0.037)	-0.437 (-0.859, -0.015)
High (> 178 ng/dL)	0.756 (-0.070, 1.582)	0.363 (-0.373, 1.099)	0.415 (-0.372, 1.202)
Free triiodothyronine (FT3) (pg/mL)			
Normal (2.5-3.9 pg/mL)	Reference	Reference	Reference
Low (< 2.5 pg/mL)	-0.837 (-1.678, 0.003)	-0.784 (-1.444, -0.124)	-0.821 (-1.399, -0.242)
High (> 3.9 pg/mL)	0.370 (0.073, 0.668)	0.110 (-0.305, 0.525)	-0.006 (-0.454, 0.443)
Total thyroxine (TT4) (ug/dL)			
Normal (6.1-12.2 ug/dL)	Reference	Reference	Reference
Low (< 6.1 ug/dL)	-0.097 (-0.518, 0.324)	-0.081 (-0.410, 0.248)	-0.115 (-0.470, 0.240)
High (> 12.2 ug/dL)	-0.035 (-0.642, 0.572)	-0.045 (-0.479, 0.388)	0.048 (-0.379, 0.474)
Free thyroxine (FT4) (ng/dL)			
Normal (0.6-1.6 ng/dL)	Reference	Reference	Reference
Low (< 0.6 ng/dL)	1.776 (0.181, 3.372)	1.656 (0.211, 3.101)	1.514 (-0.001, 3.030)
High (> 1.6 ng/dL)	-0.718 (-1.963, 0.528)	-0.131 (-1.269, 1.007)	-0.066 (-1.222, 1.090)
Thyroglobulin (ng/mL)			
Normal (0-35.0 ng/mL)	Reference	Reference	Reference
High (> 35.0 ng/mL)	0.639 (-0.064, 1.342)	0.441 (-0.302, 1.185)	0.497 (-0.256, 1.251)
Thyroid peroxidase antibody (IU/mL)			
Normal (0-9.0 IU/mL)	Reference	Reference	Reference
High (> 9.0 IU/mL)	-0.050 (-0.462, 0.361)	-0.014 (-0.380, 0.352)	-0.039 (-0.391, 0.313)

CI, confidence interval.

Model 1: Adjusted for thyroid hormone and glycohemoglobin.

Model 2: Adjusted for thyroid hormone, glycohemoglobin, and obesity.

Model 3: Adjusted for thyroid hormone, glycohemoglobin, obesity and liver function.

Bold indicates significant factor, $p < 0.05$.