RELATIONSHIP OF BODY WEIGHT & ITS DISTRIBUTION WITH gamma-GT LEVELS, IN OVERWEIGHT AND OBESE PERSONS

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INTRODUCTION

Body fat and its distribution have been linked to insulin resistance.

Epidemiological studies have also related gamma-GT levels to insulin resistance and body weight.

AIM

Of the study was to reveal any trend between gamma-GT levels and body weight among the overweight-obese persons.

SUBJECTS-METHODS

220 males and 384 females attending the Diabetes - Obesity - Metabolism Department in order to lose weight, were studied retrospectively.

Fasting glucose, HbA1c, Insulin, SGOT, SGPT, ALP, gamma-GT and ferritin levels were measured.

Subjects with overt liver dysfunction were excluded.

Anthropometric measurements were performed, including weight & height for calculation of Body Mass Index, Waist Circumference, % Total Body Fat (BIA method), Sagittal Abdominal Diameter for calculation of Visceral Fat (% Visceral Fat= Visceral Fat x 100 / Total Fat).

SUBJECTS-METHODS

Alcohol consumption (g/week) was estimated and subjects were classified as having "Usual" and "More than Usual" Alcohol Consumption (UAC and MUAC respectively) with the cutoff point of 150g/week for males and 100g/week for females.

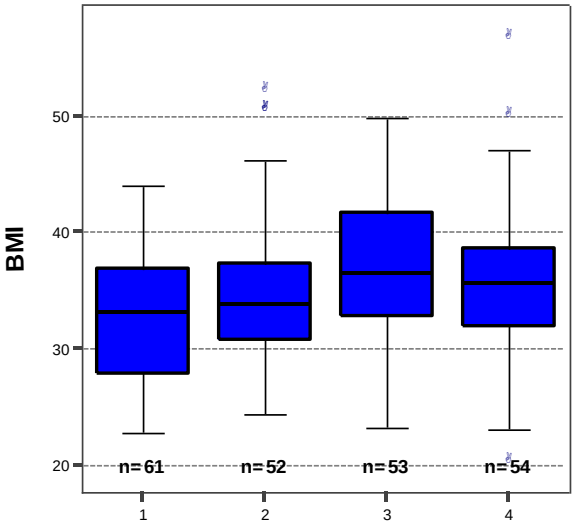
All subjects were reported as moderate coffee consumers (up to 1-3 cups of coffee daily).

Subjects were also classified as "non-diabetic" and "diabetic" considering HbA1c (cutoff point: 6.4) and fasting glucose levels (cutoff point: 125).

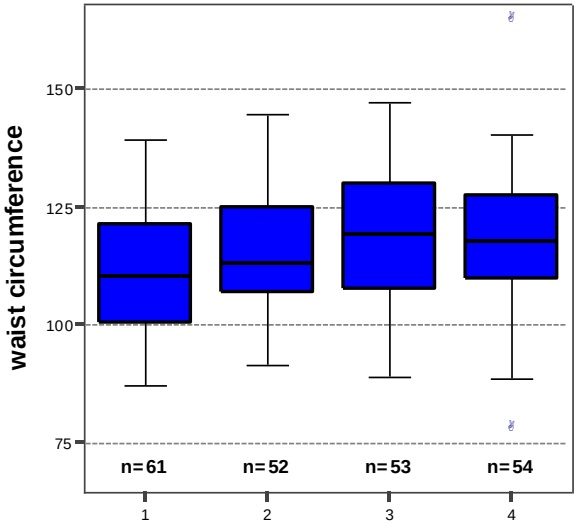
SUBJECTS

	 Males (220)	 Females (384)
Age (years)	45.9±13.8	42.2 ±13.6
BMI (Kg/m^2)	35.1 ±6.3	34.25 ±6.24
Waist Circumference (cm)	115.6 ±14.6	104.0 ±13.6
% Visceral Fat	18.8 ±4.2	9.4 ±1.7

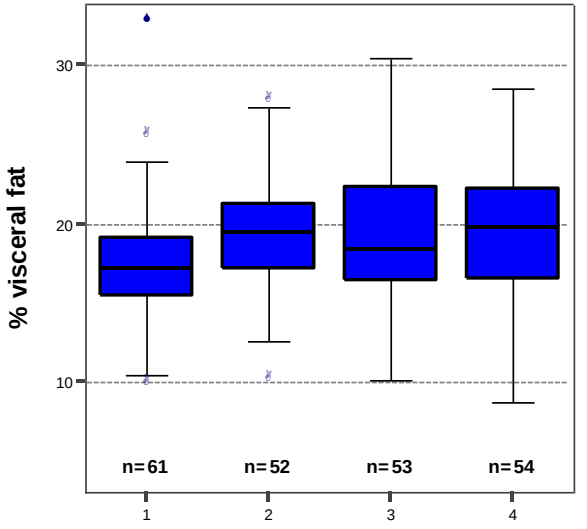
RESULTS



F=4.501, p=0.004
Difference in:
1º-3º (p=0.000)
1º-4º (p=0.027)
2º-3º (p=0.049)



F=3.341, p=0.020
Difference in:
1º-3º (p=0.003)
1º-4º (p=0.028)

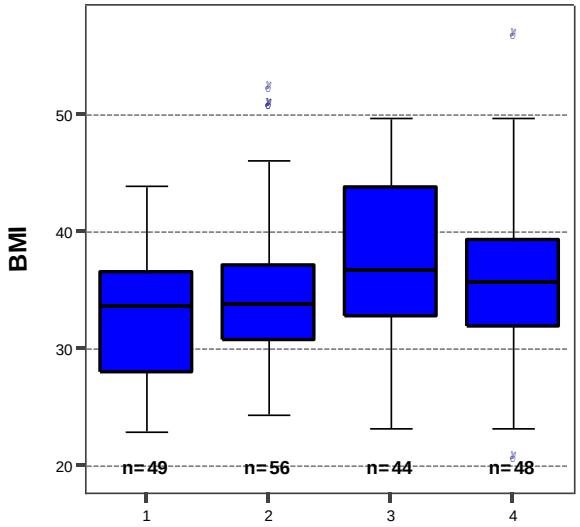


F=2.689, p=0.047
Difference in:
1º-2º (p=0.012)
1º-3º (p=0.041)
1º-4º (p=0.033)

ANOVA[a]

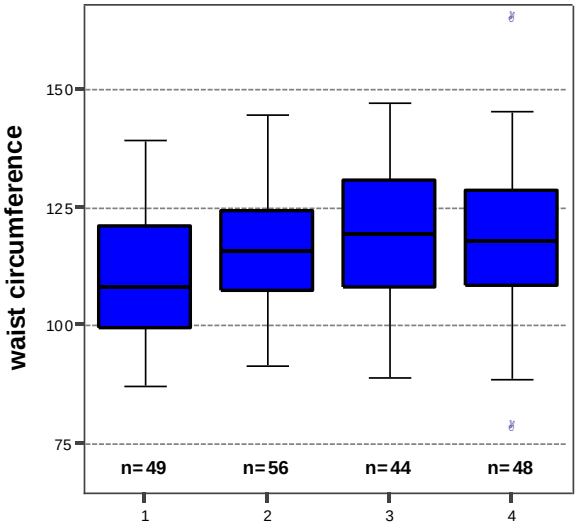
		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	516,105	3	172,035	4,501	,004
	Within Groups	8256,364	216	38,224		
	Total	8772,469	219			
waist circumference	Between Groups	2081,563	3	693,854	3,341	,020
	Within Groups	44861,115	216	207,690		
	Total	46942,678	219			
% visceral fat	Between Groups	140,156	3	46,719	2,689	,047
	Within Groups	3753,268	216	17,376		
	Total	3893,423	219			

a. sex = male



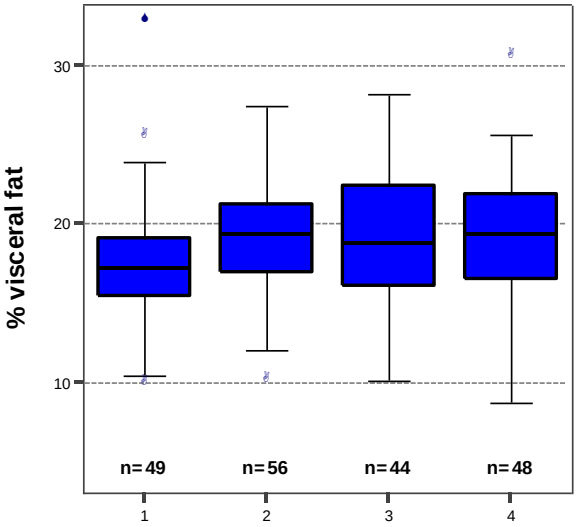
gamma GT quartiles according to males with usual alcohol consumption

F=4.578, p=0.004
Difference in:
1º-3º (p=0.001)
1º-4º (p=0.013)
2º-3º (p=0.032)



gamma GT quartiles according to males with usual alcohol consumption

F=4.006, p=0.009
Difference in:
1º-2º (p=0.022)
1º-3º (p=0.002)
1º-4º (p=0.007)



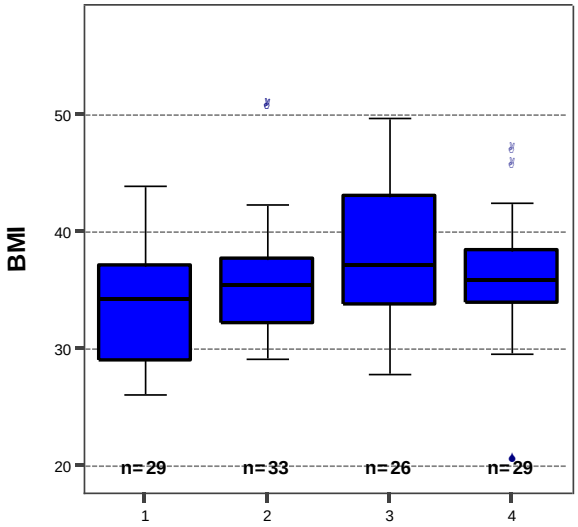
gamma GT quartiles according to males with usual alcohol consumption

No significant difference

ANOVA[a]

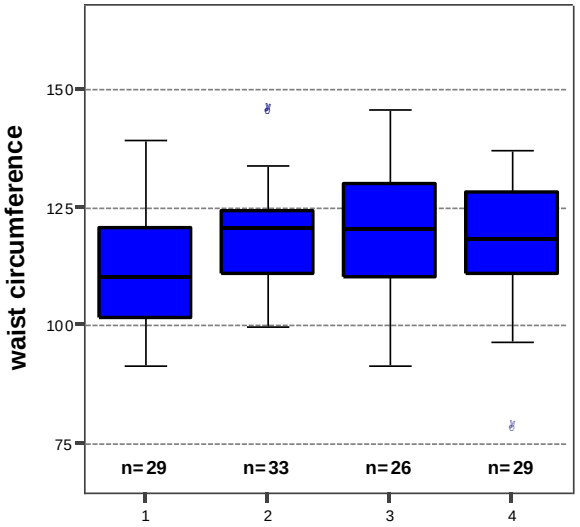
		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	539,532	3	179,844	4,578	,004
	Within Groups	7582,472	193	39,287		
	Total	8122,004	196			
waist circumference	Between Groups	2520,429	3	840,143	4,006	,009
	Within Groups	40478,712	193	209,734		
	Total	42999,141	196			
% visceral fat	Between Groups	74,125	3	24,708	1,442	,232
	Within Groups	3306,268	193	17,131		
	Total	3380,393	196			

a. sex = male



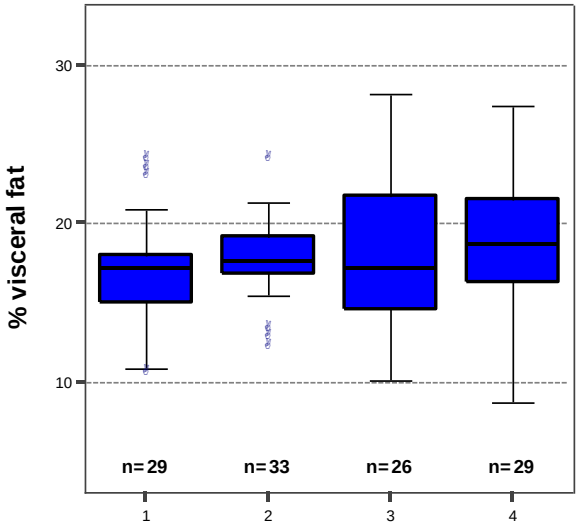
gamma GT quartiles according to non-diabetic males with usual alcohol consumption

F=3.410, p=0.020
Difference in:
1º-3º (p=0.002)



gamma GT quartiles according to non-diabetic males with usual alcohol consumption

F=3.890, p=0.010
Difference in:
1º-2º (p=0.011)
1º-3º (p=0.002)
1º-4º (p=0.049)

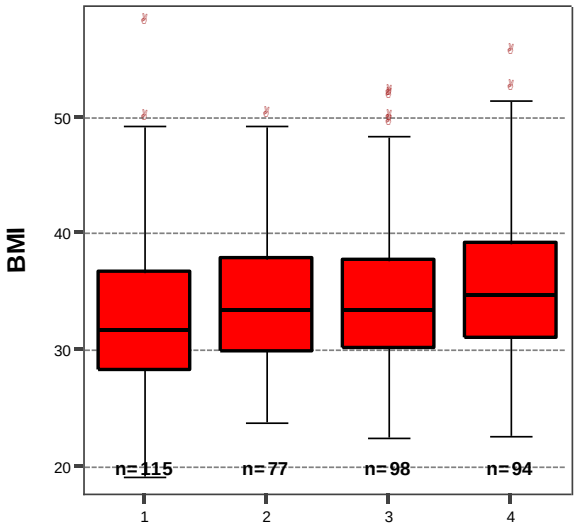


gamma GT quartiles according to non-diabetic males with usual alcohol consumption

No significant difference

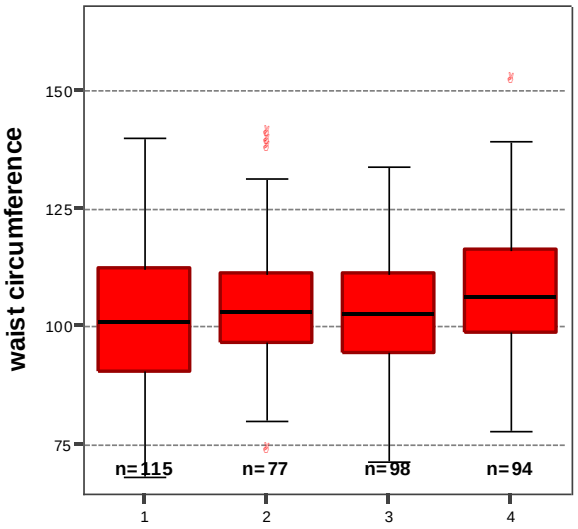
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	293,791	3	97,930	3,410	,020
	Within Groups	3245,313	113	28,720		
	Total	3539,104	116			
waist circumference	Between Groups	1872,826	3	624,275	3,890	,011
	Within Groups	18135,623	113	160,492		
	Total	20008,449	116			
% visceral fat	Between Groups	51,678	3	17,226	1,224	,304
	Within Groups	1590,493	113	14,075		
	Total	1642,171	116			



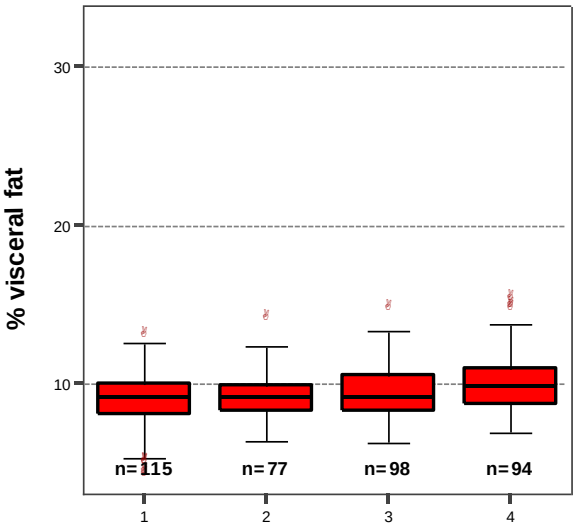
gamma GT quartiles according to females

F=3.653, p=0.013
Difference in:
1º-3º (p=0.042)
1º-4º (p=0.001)



gamma GT quartiles according to females

F=3.834, p=0.010
Difference in:
1º-4º (p=0.001)



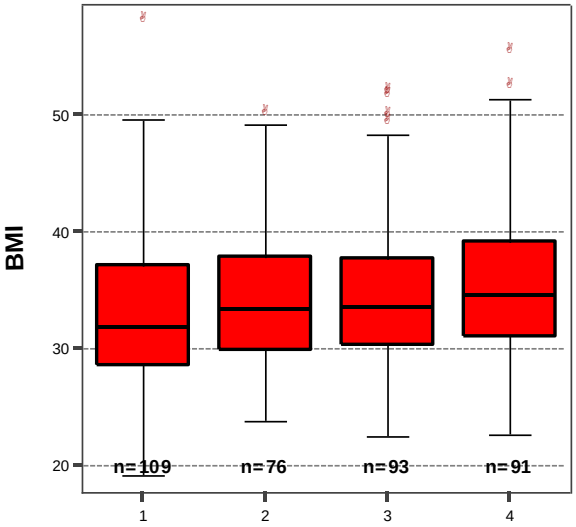
gamma GT quartiles according to females

F=7.337, p=0.000
Difference in:
1º-3º (p=0.038)
1º-4º (p=0.000)
2º-4º (p=0.001)
3º-4º (p=0.017)

ANOVA[a]

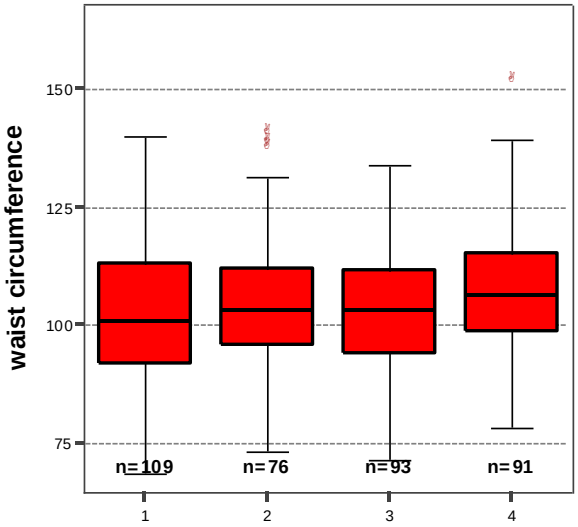
		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	417,400	3	139,133	3,653	,013
	Within Groups	14473,653	380	38,089		
	Total	14891,053	383			
waist circumference	Between Groups	2101,279	3	700,426	3,834	,010
	Within Groups	69425,919	380	182,700		
	Total	71527,198	383			
% visceral fat	Between Groups	57,651	3	19,217	7,337	,000
	Within Groups	995,291	380	2,619		
	Total	1052,941	383			

a. sex = female



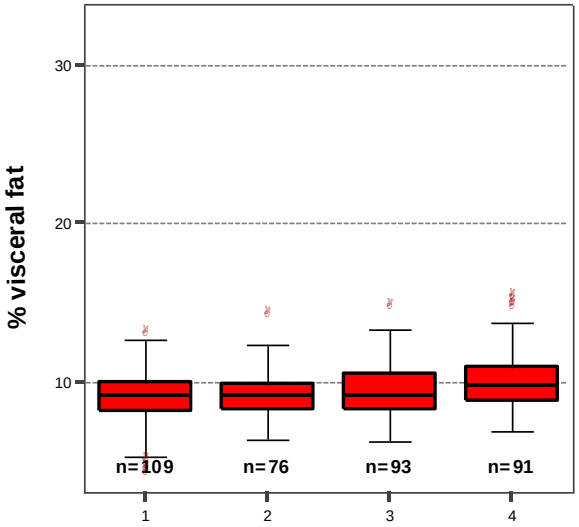
gamma GT quartiles according to females with usual alcohol consumption

F=2.742, p=0.043
Difference in:
1º-4º (p=0.005)



gamma GT quartiles according to females with usual alcohol consumption

F=2.705, p=0.045
Difference in:
1º-4º (p=0.005)



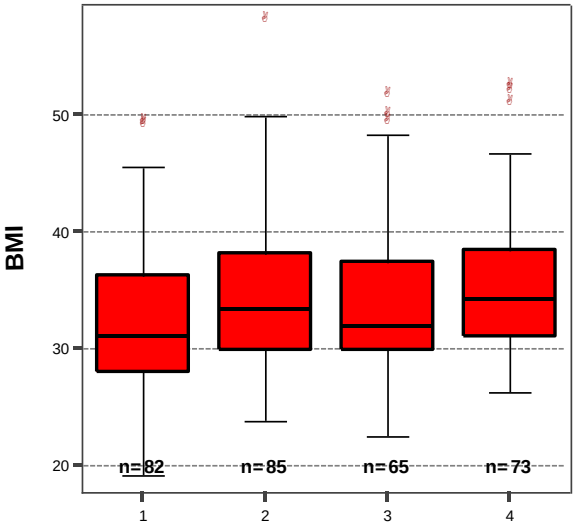
gamma GT quartiles according to females with usual alcohol consumption

F=7.033, p=0.000
Difference in:
1º-4º (p=0.000)
2º-4º (p=0.001)
3º-4º (p=0.007)

ANOVA[a]

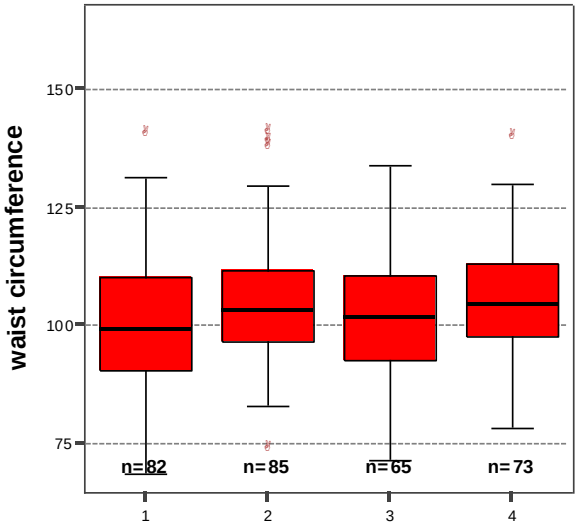
		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	316,126	3	105,375	2,742	,043
	Within Groups	14025,080	365	38,425		
	Total	14341,205	368			
waist circumference	Between Groups	1495,658	3	498,553	2,705	,045
	Within Groups	67281,221	365	184,332		
	Total	68776,880	368			
% visceral fat	Between Groups	54,569	3	18,190	7,033	,000
	Within Groups	944,061	365	2,586		
	Total	998,631	368			

a. sex = female



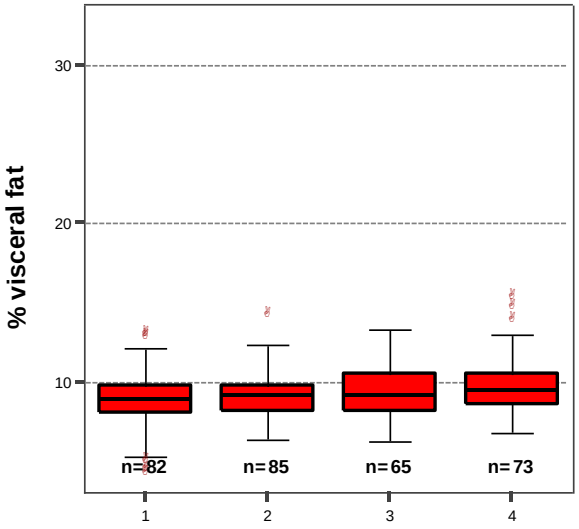
gamma GT quartiles according to non-diabetic females with usual alcohol consumption

F=3.062, p=0.028
Difference in:
1º-2º (p=0.024)
1º-4º (p=0.005



gamma GT quartiles according to non-diabetic females with usual alcohol consumption

No significant difference



gamma GT quartiles according to non-diabetic females with usual alcohol consumption

F=4.521, p=0.004
Difference in:
1º-4º (p=0.000)
2º-4º (p=0.014)

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	341,167	3	113,722	3,062	,028
	Within Groups	11180,687	301	37,145		
	Total	11521,855	304			
waist circumf erence	Between Groups	1188,284	3	396,095	2,249	,083
	Within Groups	53010,995	301	176,116		
	Total	54199,279	304			
% v isceral f at	Between Groups	34,130	3	11,377	4,521	,004
	Within Groups	757,460	301	2,516		
	Total	791,590	304			

CONCLUSIONS

Gamma-GT levels are related to
body weight and fat distribution,
not only in the general population,
but also among the overweight and obese persons,
in both sexes,
even when excluding persons
with alcohol overconsumption and persons with diabetes.

DISCUSSION

Although the primary role of hepatic gamma-GT is to metabolize extracellular reduced glutathione, recent studies have indicated that gamma-GT enzyme induction may also be closely associated with the generation of reactive oxygen species. Enhanced oxidant stress has been recently linked with obesity-associated metabolic syndrome, insulin resistance and generation of fatty liver. It is possible that enhanced serum gamma-GT activities could be regarded as a sign of generalized metabolic induction and activation of the body's defense mechanism against the metabolic burden.

SUGGESTED BIBLIOGRAPHY

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