

## Gamma-glutamyltransferase

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### Blood Pressure and Serum Lipids in Relation to Serum Gamma-glutamyltransferase Activity in Men of Rural Area

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#### = ABSTRACT =

**Objectives:** To examine the association between serum gamma-glutamyltransferase(GGT) activity level and blood pressure, serum lipids in the male residents of rural area, we analyzed cross-sectionally the data of 379 male health examinees aged 40 years and older from rural areas in Gyeongsangnam-do prefecture in Korea.

**Methods:** Blood pressure and concentration of serum lipids were compared between high and low level of serum GGT activity by t-test or Wilcoxon rank sum test. Possible confounding effects of age, body mass index and coffee drinking were adjusted by analysis of covariance.

**Results:** Adjusted values of systolic and diastolic blood pressure were higher in the group of high level of serum GGT activity in non-drinkers(P=0.055 and P=0.074 respectively) and drinkers(P=0.284 and P=0.398) of alcohol. Adjusted serum total cholesterol level was also higher in the group of high level of serum GGT activity in non-drinkers(P=0.052) but not in drinkers(P=0.981) of alcohol. In serum triglyceride, adjusted level was significantly higher in the group of high level of serum GGT activity in both non-drinkers(P=0.035) and drinkers(P=0.002) of alcohol.

**Conclusions:** These results suggest the association of serum GGT activity and serum triglyceride, total cholesterol, or blood pressure in non-drinkers of alcohol.

**KEY WORDS:** Serum gamma-glutamyltransferase, Blood pressure, Serum lipids, Rural area

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(4 ) .

[11].

gamma-glutamyltransferase (GGT) (75%) [1], [2-4], [5] 가

GGT [12]

GGT [5]. GGT

GGT [2]

GGT [6]. GGT 2000 40 1997

[7] GGT [8]. gamma-glutamyltransferase(GGT), HDL- (triglyceride) [5]가 가

GGT [9, 10] GGT (Olympus AU-5000, Japan)

(triglyceride) [2, 3]

GGT [5]. GGT HDL- 가 578

[5]. GGT [2-4] 379

[5]. GGT 가 (body mass index: kg/m<sup>2</sup>), GGT, HDL-

[1] GGT [5] GGT

0.05

(median)

GGT

Table 1, 2

, HDL-

t-

GGT 가

Wilcoxon rank sum

가 GGT 가

가 [12-14]

가 GGT

GGT

Table 3, 4

가 GGT

가

GGT

(P=0.028 P=0.018).

가

GGT 가

GGT

GGT

가

GGT

(interaction)

GGT

GGT

가

HDL-

, HDL-

가

GGT

가

95%

가

GGT

package

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GGT

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PC/SAS[15]

		가		GGT		가	
GGT	가			(P=0.055	P=0.074).		
			GGT	가			
가	가	GGT	GGT	가			(P=0.052).
	가	(P=0.003	P=0.027).	HDL-	GGT	가	GGT
GGT가	가			가			GGT
	가	(P=0.003	P=0.002).				GGT
				가			
	Table 5, 6			(P=0.035	P=0.002).		

Table 1. Mean level of systolic and diastolic blood pressure according to the level of serum  $\gamma$ -glutamyltransferase(GGT) activity stratified by coffee drinking and body mass index in non-drinkers of alcohol

	GGT (U/ℓ)	No.	Systolic blood pressure			Diastolic blood pressure		
			Mean	SD	P value	Mean	SD	P value
Coffee drinking								
Non-drinker	< 17*	39	125.6	15.5	0.226	74.4	12.3	0.194
	≥ 17	34	130.4	18.0		78.1	11.9	
Daily drinker	< 17	24	129.2	19.3	0.078	78.1	12.5	0.088
	≥ 17	31	139.2	21.4		84.0	12.5	
Body mass index								
< 22.96*	< 17	42	124.4	17.2	0.060	75.0	14.0	0.196
	≥ 17	21	133.6	19.2		79.8	12.9	
≥ 22.96	< 17	21	132.1	15.7	0.561	77.4	8.5	0.176
	≥ 17	44	135.1	20.6		81.5	12.4	

\* median value in non-drinkers of alcohol.

Table 2. Mean level of systolic and diastolic blood pressure according to the level of serum  $\gamma$ -glutamyltransferase (GGT) activity stratified by coffee drinking and body mass index in drinkers of alcohol

	GGT (U/ $\ell$ )	No.	Systolic blood pressure			Diastolic blood pressure		
			Mean	SD	P value	Mean	SD	P value
Coffee drinking								
Non- drinker	<42*	70	136.4	19.4	0.826	80.9	11.9	0.836
	$\geq$ 42	84	135.6	22.8		81.4	14.0	
Daily drinker	<42	39	131.3	17.4	0.136	79.6	11.3	0.208
	$\geq$ 42	29	138.8	23.6		83.3	12.3	
Body mass index								
<22.86*	<42	53	132.3	16.7	0.601	78.5	10.0	0.719
	$\geq$ 42	59	130.3	21.6		79.3	14.2	
$\geq$ 22.86	<42	56	136.7	20.5	0.127	82.3	12.8	0.339
	$\geq$ 42	54	143.1	22.8		84.6	12.4	

\* median value in drinkers of alcohol.

Table 3. Mean level of serum total cholesterol, HDL-cholesterol and median level of triglyceride according to the level of serum  $\gamma$ -glutamyltransferase(GGT) activity stratified by coffee drinking and body mass index in non-drinkers of alcohol

	GGT (U/ $\ell$ )	Total cholesterol				HDL-cholesterol				Triglyceride			
		No.	Mean	SD	P value	No.	Mean	SD	P value	No.	Median	95% central range	P value
Coffee drinking													
Non- drinker	<17*	39	175.1	32.6	0.028	19	54.1	7.8	0.955	19	85.0	35-218	0.003
	$\geq$ 17	34	194.6	41.9		18	53.9	14.1		18	168.5	65-493	
Daily drinker	<17	24	186.3	33.0	0.099	17	54.2	9.6	0.076	17	138.0	41-416	0.295
	$\geq$ 17	31	204.4	44.0		22	49.1	8.1		22	169.0	44-432	
Body mass index													
<22.96*	<17	42	171.7	30.0	0.018	22	57.3	7.5	0.473	22	83.0	35-214	0.027
	$\geq$ 17	21	191.2	30.6		12	54.9	11.4		12	124.5	65-264	
$\geq$ 22.96	<17	21	194.6	34.0	0.466	14	49.3	8.0	0.915	14	195.0	41-416	0.679
	$\geq$ 17	44	203.1	47.5		28	49.6	11.1		28	176.5	44-493	

\* median value in non-drinkers of alcohol.

Table 4. Mean level of serum total cholesterol, HDL-cholesterol and median level of triglyceride according to the level of serum  $\gamma$ -glutamyltransferase(GGT) activity stratified by coffee drinking and body mass index in drinkers of alcohol

	GGT (U/l)	Total cholesterol				HDL-cholesterol				Triglyceride			
		No.	Mean	SD	P value	No.	Mean	SD	P value	No.	Median	95% central range	P value
Coffee drinking													
Non-drinker	<42*	71	176.8	30.7	0.695	47	57.9	12.3	0.997	47	105.0	51-347	0.003
	$\geq$ 42	84	174.6	37.2		42	57.9	14.0		42	165.0	61-759	
Daily drinker	<42	39	190.6	36.9	0.319	29	54.9	11.5	0.274	29	158.0	41-541	0.170
	$\geq$ 42	29	201.1	49.6		20	59.3	16.2		20	177.0	52-540	
Body mass index													
<22.86*	<42	53	182.2	33.4	0.063	30	62.1	12.4	0.417	30	97.0	45-347	0.355
	$\geq$ 42	59	169.3	38.3		23	59.0	15.5		23	115.0	52-326	
$\geq$ 22.86	<42	57	181.3	33.9	0.069	46	53.3	10.4	0.093	46	113.5	51-522	0.002
	$\geq$ 42	54	194.7	42.5		39	58.0	14.3		39	191.0	66-811	

\* median value in drinkers of alcohol.

Table 5. Adjusted\* mean level of systolic and diastolic blood pressure according to the level of serum  $\gamma$ -glutamyltransferase(GGT) activity in alcohol drinking strata

Alcohol drinking	GGT (U/l)	No.	Systolic blood pressure			Diastolic blood pressure		
			Mean	SE	P value	Mean	SE	P value
Non-drinker	<17**	63	127.5	2.4	0.055	76.3	1.6	0.074
	$\geq$ 17	65	134.1	2.3		80.5	1.6	
Daily drinker	<42**	109	134.0	2.0	0.284	80.4	1.2	0.398
	$\geq$ 42	113	137.0	1.9		81.9	1.2	

\* adjusted for age, body mass index and coffee drinking.

\*\* median value.

Table 6. Adjusted\* mean level of serum total cholesterol, HDL-cholesterol and triglyceride according to the level serum  $\gamma$ -glutamyltransferase(GGT) activity in alcohol drinking strata

Alcohol drinking	GGT (U/l)	Total cholesterol				HDL-cholesterol				Triglyceride			
		No.	Mean	SE	P value	No.	Mean	SE	P value	No.	Geometric mean	95% CI	P value
Non-drinker	<17**	63	182.4	4.9	0.052	36	53.1	1.7	0.706	36	121.4	101.2-145.7	0.035
	$\geq$ 17	65	196.4	4.8		40	52.2	1.6		40	159.5	134.4-189.3	
Daily drinker	<42**	110	181.6	3.5	0.981	76	56.7	1.5	0.451	76	121.9	106.6-139.5	0.002
	$\geq$ 42	113	181.5	3.5		62	58.4	1.7		62	169.3	145.8-196.7	

\* adjusted for age, body mass index and coffee drinking.

\*\* median value.

[17].

GGT

GGT

GGT

[12]

[13, 16]. (hepatic steatosis)

[17, 18]

[19-21]

[22].

GGT

가

HDL-

GGT

가

GGT

가

GGT

[11].

GGT

GGT

[10].

가

GGT

[17].

[21].

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가; HDL-

[20]

[19].

GGT

GGT

HDL-

[2-4]

, HDL-

가 12-64

[5]

GGT

HDL-

38

[9]

GGT

HDL-

38

[10]

, HDL-

38

가

GGT

[18]

가

[22]

GGT

[1].

[27].

가 effect)가 GGT

[28] 가 GGT

가 가 GGT

[19]. 가 GGT

[2, 4] GGT

GGT

[5] GGT

[6]. 40 1997

GGT 가 2000

[1] 379

GGT GGT

[2] 5 , HDL-

GGT [7] t-

GGT Wilcoxon rank sum

가 ,

[7, 8, 10]. GGT

(P=0.055 P=0.074).

[29]. GGT 가

가 Masarei

[30] 가 (P=0.052). GGT

(residual confounding



GGT 가  
( $P=0.035$   $P=0.002$ ).

GGT 가

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