The serum triglyceride to high-density lipoprotein cholesterol ratio predicts vascular events in patients with end-stage renal disease on hemodialysis

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BACKGROUND

- High triglyceride to high-density lipoprotein cholesterol (TG/HDL-C) ratio has been reported as an independent predictor for cardiovascular disease in the general population.
- However, the prognostic effect of the TG/HDL-C ratio on hemodialysis (HD) patients is unclear.
- We conducted this study with the aim of investigating whether TG/HDL-C ratio has a prognostic impact with regard to vascular events in HD patients.

METHODS

◆ Study design and participants

- Single-center, prospective, observational cohort study,
- Between April 2012 to December 2015
- 189 patients with end-stage renal disease (ESRD) on HD were enrolled
- The TG/HDL-C ratio was categorized into tertiles based on the quantity of the study population and the distribution of TG/HDL-C ratio.

◆ Study outcomes and Statistical analysis

- The outcomes were the occurrence of vascular events (cardiovascular [CV] events, arteriovenous fistula [AVF] failure, CV mortality, and all-cause mortality) during follow up periods.
- Cox proportional hazard regression analysis was evaluated for association of serum TG/HDL-C ratio with outcomes.

RESULT

- The patients consisted of 115 males and 74 females with age 60.5±13.2years.
- During a median of the 29.8-month follow-up period, 44(23.3%) patients experienced CV events and 63(33.3%) patients experienced AVF failure.
- 13(6.9%) deaths occurred, and 5 of which (38.5%) were caused by CV events.
- On multivariate Cox regression analysis, serum TG/HDL-C ratio was independently associated with increased risk of vascular events.

Table 1.
Baseline characteristics of patients according to tertiles of TG/HDL-C ratio

	TG/HDL-C ratio tertiles			
	Tertiles 1 (n=63) <1.65	Tertiles 2 (n=64) 1.65–2.96	Tertiles 3 (n=63) >2.97	P
Age, y	60.7±13.4	59.9±14.3	60.9±11.9	0.406
Male, n, (%)	41 (65%)	34 (54%)	40 (64%)	0.385
Dialysis vintage, month	46.3±43.5	41.4±46.8	34.8±42.8	0.523
Hypertension, n, (%)	54 (86%)	51 (81%)	55 (87%)	0.589
Diabetes mellitus, n, (%)	22 (35%)	32 (51%)	37 (59%)	0.025
Previous CVD, n, (%)	20 (32%)	24 (38%)	23 (37%)	0.740
Body mass index, kg/m2	22.6±2.8	23.4±4.5	23.6±3.5	0.006
Laboratory data				
Hemoglobin, g/dL	9.9±0.9	10.3±1.1	10.1±1.1	0.196
Creatinine, mg/dL	9.7±2.9	9.3±3.1	8.6±2.9	0.814
Kt/V	1.5±0.3	1.5±0.3	1.4±0.4	0.487
K	4.9±0.7	4.8±0.7	4.7±0.8	0.903
CaxP	41.7±13.5	40.8±13.1	37.3±10.7	0.232
PTH	134.9±128.4	225.1±433.2	150.0±109.2	0.012
Albumin	3.8±0.2	3.9±0.3	3.9±0.3	0.774
Total cholesterol	145.7±31.3	146.1±35.2	143.2±30.5	0.486
Triglyceride	62.7±21.7	101.3±23.6	166.8±54.5	<0.001
HDL-C	57.7±12.7	44.3±9.0	36.1±7.5	0.001
LDL-C	76.9±24.3	85.9±29.7	83.6±28.0	0.391
TG/HDL-C	1.1±0.4	2.3±0.4	5.1±3.9	<0.001
Medications				
Antihypertensive drugs, n,(%)	50 (79%)	42 (67%)	50 (79%)	0.163
Antiplatelet drugs, n, (%)	40 (64%)	39 (62%)	40 (64%)	0.978
Lipid lowering drugs, n, (%)	14 (22%)	22 (35%)	26 (41%)	0.068

- The third tertile of the TG/HDL-C ratio (>2.97) was associated with increased risk of CV events (HR 3.31, CI 95% 1.31-8.38, p=0.01) and AVF failure (HR 2.28, CI 95% 1.15-4.52, p=0.02).
- The second tertile of the TG/HDL-C ratio (1.65-2.99) also showed increased risk of CV events (HR 2.89, CI 95% 1.12-7.48, p=0.03) and AVF failure (HR1.75, CI 0.86-3.57, p=0.12).
- From the Kaplan-Meier curves according to TG/HDL-C ratio, each tertiles showed a progressively worse event free survival and apparent separation (log-rank p =0.01 in CV events and p=0.02 in AVF failure).

Table 2. CV events, AVF failure, CV mortality, and all-cause mortality during follow-up

	TG/HDL-C ratio tertiles			
	Tertiles 1	Tertiles 2	Tertiles 3	P
CV events, n, (%)	6 (9.5%)	16 (25.4%)	20 (31.7%)	0.01
Stroke or TIA, n, (%)	0 (0%)	3 (5.9%)	3 (5.6%)	0.21
Acute coronary syndrome, n, (%)	6 (9.5%)	13 (19.5%)	17(26.1%)	0.04
AVF failure, n, (%)	13 (20.6%)	21 (33.3%)	27 (42.9%)	0.03
CV mortality, n, (%)	1 (1.6%)	2 (3.2%)	2 (3.2%)	0.81
All-cause mortality, n, (%)	5 (7.9%)	5 (7.9%)	3 (4.8%)	0.72

Table 3.
Predictors of CV events in univariable and multivariable Cox regression analyses.

	Univariable		Multivariable	
	HR (95% CI)	p	HR (95% CI)	p
Age	1.03 (1.01-1.06)	0.02	1.02 (0.99-1.05)	0.27
Male sex	0.53 (0.29-0.97)	0.04	0.61 (0.26-1.44)	0.26
Dialysis vintage	1.01 (0.99-1.01)	0.11		
Hypertension	0.84 (0.39-1.81)	0.66		
Diabetes mellitus	1.73 (0.93-3.21)	0.08	0.85 (0.41-1.78)	0.66
Previous CVD	4.46 (2.34-8.49)	<0.001	3.88 (1.94-7.76)	<0.001
Body mass index	1.02 (0.95-1.10)	0.69		
Kt/V	2.31 (0.90-5.94)	0.08	1.49 (0.42-4.52)	0.60
CaxP	0.99 (0.96-1.01)	0.28		
Antihypertensive drugs	0.97 (0.49-1.96)	0.97		
Antiplatelet drugs	1.41 (0.73-2.76)	0.31		
Lipid lowering drugs	2.23 (1.22-4.09)	0.01	1.64 (0.84-3.22)	0.15
Tertile 2 vs.1	3.08 (1.21-7.88)	0.02	2.89 (1.12-7.48)	0.03
Tertile 3 vs. 1	3.80 (1.53-9.48)	<0.01	3.31 (1.31-8.38)	0.01

Table 4.
Predictors of AVF failure in univariable and multivariable Cox regression analyses.

	Univariable		Multivariable	
	HR (95% CI)	p value	HR (95% CI)	p value
Age	1.01 (0.99-1.03)	0.21		
Male sex	1.28 (0.75-2.17)	0.36		
Dialysis vintage, month	1.00 (0.99-1.00)	0.36		
Hypertension	1.90 (0.82-4.42)	0.14		
Diabetes mellitus	1.62 (0.97-2.69)	0.06	1.27 (0.74-2.17)	0.38
Previous CVD	1.28 (0.76-2.15)	0.35		
Body mass index	0.96 (0.90-1.01)	0.12		
Kt/V	0.72 (0.33-1.58)	0.42		
CaxP	0.99 (0.96-1.00)	0.23		
Antihypertensive drugs	1.38 (0.73-2.59)	0.32		
Antiplatelet drugs	1.81 (1.02-3.20)	0.04	1.66 (0.93-2.96)	0.09
Lipid lowering drugs	1.09 (0.64-1.85)	0.74		
Tertile 2 vs.1	1.79 (0.89-3.59)	0.09	1.75 (0.86-3.57)	0.12
Tertile 3 vs. 1	2.49 (1.28-4.83)	0.01	2.28 (1.15-4.52)	0.02

CONCLUSION

- Our data suggest that a high serum TG/HDL-C ratio was associated with an increased risk of CV event and AVF failure in ESRD patients on HD, independently of several potential confounders. Further evaluations with large number are needed.