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# Apolipoprotein B predicts the risk of end-stage renal disease

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**Objectives:** Apolipoprotein B (ApoB), associated with lipid particles, is known to increase the risk of cardiovascular diseases. However, the predictive value of apolipoprotein B on the end stage renal disease as a major kidney outcome remains unresolved.

**Methods:** The predictability of ApoB was evaluated in 9,389 subjects whose ApoB, ApoA1, and lipid subfraction were profiled at the same time. Their kidney functions were estimated and followed until the event of end-stage renal disease (ESRD).

**Results:** The ESRD occurred in 96 patients (1.0%) during 10 years of maximum follow-up period. When several lipid parameters including ApoB, ApoA1, and lipid subfraction score were compared, ApoB was one of the significant predictors for the ESRD risk. The 2$^{nd}$ and 3$^{rd}$ tertile groups had a higher risk of ESRD than the 1$^{st}$ tertile group with HRs of 1.9 (1.05–3.45) and 3.0 (1.75–5.27), respectively. In this respect, the high ratio of ApoB and ApoA1 (i.e., ApoB/ApoA1) was associated with the risk of ESRD. However, ApoA1 alone did not predict the risk of ESRD.

**Conclusions:** High ApoB level is associated with the risk of ESRD, even in accompany with the adjustment of lipid subfraction results. Accordingly, monitoring of ApoB may be useful to establish a strategy for a healthier kidney.

Table 1. Lipid parameter in predicting the risk of end stage renal disease

Table 2. Lipid parameter in predicting the risk of end stage renal disease

| | Univariate | | Multivariate* | |
|---|---|---|---|---|
| | HR (95% CI) | *P* | HR (95% CI) | *P* |
| Apolipoprotein B | 1.020 (1.012–1.029) | < 0.001 | 1.037 (1.018–1.057) | < 0.001 |
| Apolipoprotein A1 | 0.983 (0.972–0.994) | 0.003 | – | |
| Total cholesterol | 1.005 (1.000–1.010) | 0.038 | 0.979 (0.963–0.994) | 0.006 |
| Triglyceride | 1.003 (1.001–1.004) | < 0.001 | – | |
| HDL | 0.946 (0.927–0.966) | < 0.001 | 0.970 (0.946–0.995) | 0.017 |
| VLDL | 1.019 (1.009–1.030) | < 0.001 | – | |
| IDL | 1.048 (1.037–1.060) | < 0.001 | 1.074 (1.049–1.099) | < 0.001 |
| LDL | 1.004 (0.990–1.029) | 0.274 | 0.987 (0.974–1.000) | 0.046 |

Abbreviations: HDL, high-density lipoprotein; VLDL, very low-density lipoprotein; IDL, intermediate-density lipoprotein; LDL, intermediate low-density lipoprotein

*Adjusted for age, sex, body mass index, smoking status, diabetic mellitus, hypertension, coronary artery disease

Table 2. Risk of end stage renal disease according to the apolipoprotein B and A1 levels

Table 3. Risk of end stage renal disease according to the apolipoprotein B and A1 levels

| | | Univariate | | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Tertiles | HR (95% CI) | *P* | HR (95% CI) | *P* | HR (95% CI) | *P* | HR (95% CI) | *P* |
| ApoB | Q 1 | 1 (Reference) | < 0.001* | 1 (Reference) | < 0.001* | 1 (Reference) | 0.004* | 1 (Reference) | < 0.001* |
| | Q 2 | 1.902 (1.049–3.449) | 0.034 | 1.963 (1.082–3.559) | 0.026 | 2.160 (1.185–3.937) | 0.012 | 2.420 (1.322–4.428) | 0.004 |
| | Q 3 | 3.033 (1.747–5.266) | < 0.001 | 3.339 (1.921–5.804) | < 0.001 | 2.583 (1.463–4.560) | 0.001 | 3.337 (1.884–5.912) | < 0.001 |
| ApoA1 | Q1 | 1 (Reference) | 0.001* | 1 (Reference) | 0.002* | - | | - | |
| | Q 2 | 0.444 (0.270–0.728) | 0.001 | 0.466 (0.284–0.765) | 0.003 | - | | - | |
| | Q 3 | 0.495 (0.304–0.808) | | 0.506 (0.310–0.824) | 0.006 | - | | - | |
| ApoB/A1 ratio | Q 1 | 1 (Reference) | < 0.001* | 1 (Reference) | < 0.001* | 1 (Reference) | 0.058* | 1 (Reference) | 0.031* |
| | Q 2 | 2.351 (1.196–4.624) | 0.013 | 2.442 (1.241–4.802) | 0.010 | 2.094 (1.061–4.133) | 0.033 | 2.105(1.062–4.173) | 0.033 |
| | Q 3 | 4.673 (2.505–8.717) | < 0.001 | 4.961 (2.659–9.257) | < 0.001 | 2.139 (1.122–4.077) | 0.021 | 2.373 (1.247–4.518) | 0.009 |

Model 1: adjusted for age, sex, body mass index, and smoking status.

Model 2: adjusted for model 1 plus comorbidity and blood laboratory findings.

Model 3: adjusted for model 2 plus medications.

**P* value for trend.