Difference in Plasma Cholesterol Levels between Fasting and Postprandial States in Healthy Volunteers

Nutchanart Ratchusupakarn\(^1\) Supamai Soonthornpun\(^1\)

\(^1\)Department of Internal Medicine, Faculty of Medicine, Prince of Songkla University, Hatyai, Songkhla 90110 Thailand

**Background:** When the direct LDL-cholesterol measurement is available and postprandial triglyceride level is found to be a risk factor of cardiovascular diseases, some guidelines are recommended to use non-fasting blood samples for assessment of plasma lipid profiles. However, some studies showed that plasma cholesterol levels are significantly decreased after meal with no clear explanation of the mechanism. Hemodilution dilution after meals and diurnal variation of cholesterol synthesis may influence the levels of plasma cholesterol. Most of the previous studies were designed to use high fat diet and obtain postprandial blood samples 3-5 hours after fasting blood samples. In our daily life, most of breakfast is a low fat meal and either fasting or postprandial blood samples are mostly obtained at the same time in the morning. To minimize these limitations and to confirm the effect of meal on plasma cholesterol levels in real-life practice, this study uses a crossover design and participants have their usual breakfast during the study and could drink water on the day of fasting.

**Objective:** To determine the effect of meal on plasma cholesterol levels.

**Methods:** A randomized crossover study was performed in healthy volunteers. Blood samples were obtained during 8-10 AM on 2 occasions and 1 week apart. One occasion was after 12-hour fast and another occasion was after breakfast. The participants were told to have their usual breakfast and water intake was allowed ad libitum during the fasting period. Total calories and compositions of the breakfast meal were calculated. Body weight, hematocrit, plasma albumin, lipid profiles, and glucose were measured on both occasions. Total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglyceride levels were assessed by enzymatic colorimetric assay using Cobas® 8000 analyzer. Data were shown as mean±SD. Mean differences of variables between the 2 occasions were determined by Student paired-t test.

**Results:** Of 121 participants, 5 were excluded due to having diabetes (n=3), hypothyroidism (n=1), and taking lipid lowering agents (n=1). Sixteen subjects with postprandial triglyceride levels of more than 20% lower than fasting triglyceride levels were also excluded because of unlikely to follow the study protocol properly. Of 100 subjects remaining for analysis, 38 were male and 62 were female with the age of 38.5±9.6 years and BMI of 23.4±4.0 kg/m\(^2\). The total calories of breakfast on the day of postprandial test were 300.1±145.5 kcal with 24.5±14.0 % fat. Although the body weight was not different between the 2 occasions, hematocrit and plasma albumin levels in postprandial blood samples were significantly lower than those in fasting blood samples. When compared with fasting state, total cholesterol, LDL-cholesterol, and HDL-cholesterol levels in postprandial state were significantly lower (200.3±36.7 vs 197.0±36.0 mg/dl, p=0.01 for total cholesterol, 139.6±35.2 vs 134.4±33.2 mg/dl, p<0.001 for LDL-cholesterol, and 59.3±13.7 vs 56.7±13.5 mg/dl, p<0.001 for HDL-cholesterol). After corrected for hematocrit or plasma albumin levels, the results of LDL-cholesterol and HDL-cholesterol remained unchanged while total cholesterol levels were no longer different.

**Conclusion:** LDL-cholesterol and HDL-cholesterol levels in the fasting state are statistically significantly higher than those in the postprandial state.

**Keywords:** Fasting, Postprandial, plasma cholesterol