Does Coffee Affect the Validity of an Oral Abbreviated Fat Tolerance Test in Healthy Adults?

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ABSTRACT

Introduction: Postprandial triglycerides (TG), or levels of fat in the blood after a meal, are an independent risk factor for cardiovascular disease (CVD)(1) . A clinically feasible test to assess postprandial TG has been developed, known as the abbreviated fat tolerance test (AFTT)(2), however the impact of coffee consumption prior to an AFTT on postprandial TG is unknown. Considering that 50% of Americans consume one cup of coffee before or with breakfast(3), this study aimed to investigate the effect of coffee consumption prior to an AFTT on postprandial TG in order to determine if coffee intake prior to an AFTT affects the validity of the AFTT. Methods: Participants completed 2 randomized AFTT separated by at least one week, but not exceeding two weeks, in duration. For each AFTT, participants arrived into the laboratory following a 10-hour overnight fast and consumed 1 cup of water or black coffee. Thirty-minutes later, a baseline blood draw was collected. Immediately following, the participant consumed a standardized high-fat shake, vacated the laboratory, and returned 4-hours later for a follow-up blood draw. Results: Six healthy individuals completed the present study. Two-way ANOVA of TG revealed a significant overall time effect (p = 0.008), but not time x trial interaction (p = 0.87) or overall trial effect (p = 0.27). Absolute change in TG was not different between trials (p = 0.61). Conclusion: In our small study sample, coffee intake prior to an AFTT did not affect postprandial TG. Therefore, coffee intake prior to an AFTT may not affect the validity of the AFTT. Further research should investigate the effects of coffee consumption prior to an AFTT on the validity of the AFTT in a larger, more diverse study population.

BACKGROUND

- Cardiovascular disease is the leading cause of death in the United States (1).
- Postprandial TG have been identified as an independent risk factor for CVD.
- Standard postprandial TG tests are time-consuming, tedious, and burdensome for the participant. Our laboratory has developed and validated a clinically feasible test for assessing postprandial TG known as the Abbreviated Fat Tolerance Test (AFTT).
- More than 50% of Americans consume at least one cup of coffee before or with breakfast, however the effects of coffee consumption prior to an AFTT on postprandial TG are largely unknown.
- Therefore, the purpose of this experiment was to determine the effect of coffee consumption prior to an AFTT on the postprandial TG response. We hypothesized that coffee intake prior to an AFTT would significantly lower each participant's response.

METHODS

We intended to recruit 10 participants (5 women, 5 men). Because of extenuating circumstances associated with the COVID-19 pandemic, 6 participants (3 women, 3 men) completed the present study. Participants were recruited based on the following characteristics:

- Age: 18-40 years
- Free of chronic disease or any dietary intolerances
- Not currently taking medications or supplements that alter metabolic outcomes such as TG or medications that alter blood pressure.

AFTT:

- Participants did not partake in any planned exercise for the two days leading up to their trials.
- After consuming the provided snack (200 kcal) the night before each trial, participants completed a 10-hour overnight fast prior to arriving to the laboratory.
- On the morning of each trial, participants consumed either 8-ounces of black coffee or 8-ounces of water 30-minutes prior to their fasting blood draw, collected using traditional phlebotomy methods.
- Next, participants consumed a high fat shake containing vegan protein powder, chocolate syrup, and coconut cream, in less than 20 minutes. Average kcal: 670.3; Average protein: 16.7 g; Average CHO: 35.2 g; Average fat: 52.2 g.
- Participants were instructed to leave the laboratory, abstaining from any planned exercise and the consumption of food/drink other than water for 4-hours; they returned to the lab 4-hours post-meal consumption and a follow-up blood draw was collected.

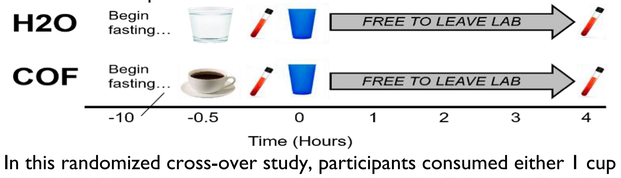

Figure 1. In this randomized cross-over study, participants consumed either 1 cup of water (H2O) or black coffee (COF) 30 minutes prior to the Abbreviated Fat Tolerance Test (AFTT)

RESULTS

Participant and meal characteristics

	Total	Men	Women
Age	21.3 ± 3.2	23.7 ± 3.1	19.0 ± 0.0
Weight (kg)	74.5 ± 6.6	78.8 ± 6.5	70.1 ± 3.1
Height (cm)	171.7 ± 9.3	180 ± 3.0	163.3 ± 0.6
Systolic BP	114.5 ± 10.7	120.3 ± 8.0	108.7 ± 11.0
Diastolic BP	80.5 ± 12.3	80.7 ± 14.6	80.3 ± 12.9
Fat Mass (%)	24.8 ± 10.3	16.0 ± 5.6	33.7 ± 1.5
Skeletal Muscle Mass(%)	36.0 ± 5.8	41.0 ± 2.6	31.0 ± 0.1
Shake kcal	670.3 ± 59.4	709.5 ± 58.5	631.2 ± 28.2
Shake protein (g)	16.7 ± 1.5	17.7 ± 1.5	15.8 ± 0.7
Shake carbohydrate (g)	35.2 ± 3.1	37.2 ± 3.1	33.1 ± 1.5
Shake fat (g)	52.2 ± 4.6	55.2 ± 4.5	49.1 ± 2.3

Table 1. Participant and meal characteristics. Participant characteristics represent values averaged across participants. Meal characteristics represent data for the high-fat shake averaged across participants. Data are presented as mean ± SD. TG, triglycerides; BMI, body mass index.

Overall, coffee consumption prior to an AFTT did not affect postprandial TG.

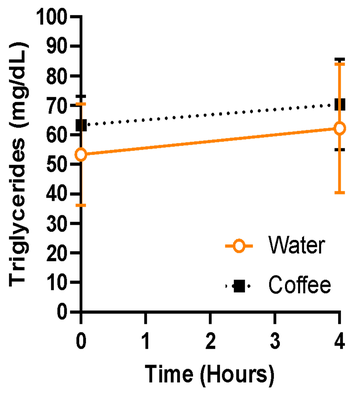

Figure 2. Postprandial TG responses. Postprandial TG responses in the two meal trials at baseline and 4-hours post-meal consumption. Error bars indicate SD.

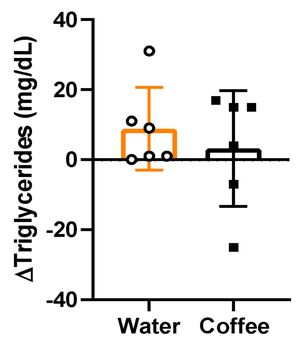

Figure 3. Absolute change in TG from baseline. Absolute change in TG from baseline in the two meal trials. Error bars indicate SD. Individual participant responses are represented by open circles (water) or closed squares (coffee).

Metabolic outcomes did not differ across meal trials.

	Water	Coffee	P-value
Glucose (mg/dL)	87.7 ± 4.7	88.7 ± 6.9	0.77
Total Cholesterol (mg/dL)	160.5 ± 64.2	160.2 ± 29.5	0.99
HDL-Cholesterol (mg/dL)	64.3 ± 15.0	57.8 ± 13.6	0.10

Table 2. Metabolic outcomes. Metabolic outcomes represent fasting data for each meal trial averaged across participants. Data are presented as mean ± SD.

Individual postprandial TG responses for each meal trial for all participants.

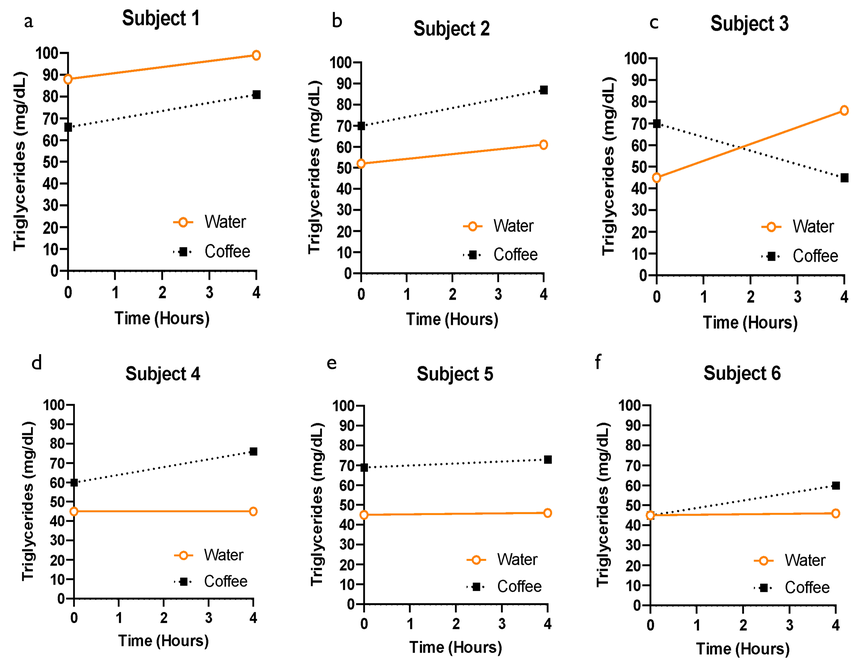

Figure 4. Postprandial TG responses. Postprandial TG responses for each meal trial at baseline and 4-hours post-meal consumption for all participants (A-F).

CONCLUSIONS

In our small sample, the results of our study indicate that the consumption of coffee prior to an AFTT did not affect the postprandial TG response. Therefore, the validity of the AFTT may not be attenuated by pre-AFTT coffee consumption. In order to lift the restriction of coffee consumption prior to an AFTT and employ these findings in the clinical setting, further research should be conducted in a larger sample size to further determine the effect of coffee consumption prior to an AFTT on postprandial TG.

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