Effects of Alcohol Consumption on Nephropathy, Retinopathy, and Neuropathy in Type 1 Diabetes in the Diabetes Control and Complications Trial (DCCT)

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BACKGROUND/OBJECTIVES

Regular alcohol consumption is common among American adults and has been associated with cardio-protection. Heavy alcohol consumption, however, can lead to adverse outcomes, such as neurological and renal damage, stroke, and premature death. Effects of long-term alcohol consumption have not been well studied in populations with diabetes, though it is estimated that at least 10% of Americans have diabetes. Complications of diabetes are common, and include damage to the nervous system, kidneys, and eyes, among others. Individuals living with diabetes who are heavy alcohol consumers may be at heightened risk for diabetic complications.

METHODS

DCCT (1983 – 1993)

- 1,441 participants were randomized to one of two treatment arms (intensive or conventional) at 29 clinical centers throughout the United States and Canada.
  - *Conventional treatment arm*: participants administered one or two insulin injections daily (did not adjust insulin dosage daily), monitored blood glucose/urine daily, were educated about diet and exercise, and came into the clinical centers for evaluation every three months.
  - *Intensive treatment arm*: participants administered insulin three or more times daily by injection or external pump. Dosage was adjusted at least four times per day, and they were seen at their clinical center monthly.
- At randomization, participants were 13-39 years of age, insulin dependent, and without any history of hypertension, hypercholesterolemia, severe medical conditions, or severe diabetic complications. DCCT participants were followed for a mean of 6.5 years.

Current Analysis

- Participants were excluded from analysis if they were under 18 years of age at baseline (n=1,246). Analyses were conducted at baseline, DCCT follow-up year 5, and DCCT closeout so long as the outcome and predictor variables in each of the analyses were not missing.
- *Independent variable*: alcohol consumption, collected by self-report during the DCCT annual visit through an interview-administered questionnaire.
  - Participants were considered "drinkers" if they responded that they consumed at least one alcoholic beverage per week in the last 12 months at each of the 3 separate time points.
- *Dependent variables*: retinopathy, nephropathy, and neuropathy (analyzed as absent/present) at each of the 3 time points.
- Potential confounding variables included gender, hemoglobin A1c (HbA1c) levels, smoking status, education level, marital status, LDL cholesterol level, treatment status (intensive vs. conventional), and age.

FIGURE 1:

Mean HbA1c by Concurrent Drinking Status in the Conventional Treatment Group by DCCT Study Year

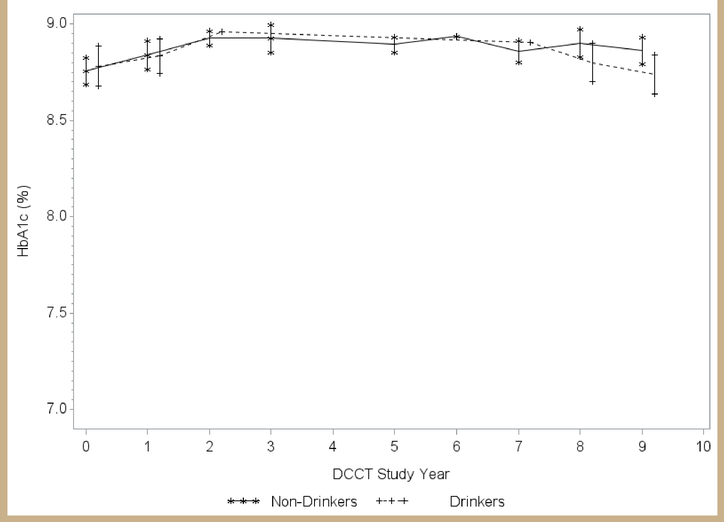

FIGURE 2:

Mean HbA1c by Concurrent Drinking Status in the Intensive Treatment Group by DCCT Study Year

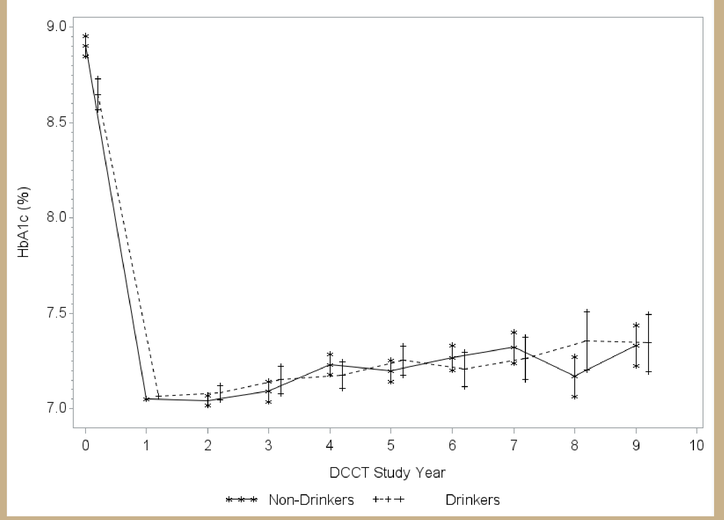

TABLE 1:

Odds of Retinopathy at Year 5 and Closeout Predicted by Drinking Status at Year 5

	No. of events (%) Drinkers	No. of events (%) Non-Drinkers	Unadjusted OR	Adjusted OR*
	N=602	N=343		
Year 5	26 (4)	8 (2)	0.53 (0.24, 1.18)	0.44 (0.18, 1.05)
	N=602	N=343		
Closeout	30 (5)	13 (4)	0.75 (0.39, 1.46)	0.63 (0.31, 1.31)

TABLE 2:

Odds of Neuropathy at Closeout Predicted by Drinking Status at Closeout

	No. of events (%) Drinkers	No. of events (%) Non-Drinkers	Unadjusted OR	Adjusted OR*
	N=756	N=454		
Closeout	113 (15)	52 (11)	0.74 (0.52, 1.05)	0.69 (0.47, 1.00)

*Odds ratios were adjusted for age, sex, baseline smoking status, baseline marital status, baseline education, baseline HbA1c, baseline LDL, and treatment group (intensive vs. conventional).

RESULTS

- Due to small sample size of heavy drinkers at baseline (n=17), formal statistical comparisons concerning this group were not feasible.
- HbA1c did not vary between drinkers and non-drinkers throughout the DCCT, regardless of treatment group (Figure 1, Figure 2) leading to non-significant odds (p>.05) of developing neuropathy, retinopathy, and nephropathy at baseline, year 5, and closeout.
- Slightly protective effects of drinking demonstrated that drinkers at year 5 were 56% less likely have retinopathy at year 5 (OR=0.44 (0.18, 1.05)) (Table 1), and that drinkers at closeout were 30% less likely to have neuropathy at closeout (OR=0.69 (0.47, 1.00)) compared to non-drinkers (Table 2).
- All other analyses did not yield statistically significant results, including analysis of drinking as a continuous variable.

CONCLUSIONS

- Though most results of this analysis were not statistically significant, trends in ORs were consistent with the current literature. Non-heavy alcohol drinking did not substantially impact development of renal, retinal, or neurological complications within the DCCT cohort, which is likely due to the near-identical HbA1c values between drinkers and non-drinkers throughout the study.
- Limitations of this analysis include:
  - Small sample size (n=17) of heavy drinkers, preventing analysis with this group
  - Ethnically non-diverse sample (97% white non-Hispanic)
  - Lack of distinction between non-drinkers and former drinkers
  - Probable underreporting of drinking behaviors

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