

The association between urinary caffeine and caffeine metabolites and diabetic retinopathy in individuals with diabetes: NHANES 2009-2014

Xiaodong Chen^{1,2,3}, Jiarui Li^{1,2,3}, Ningda Xu^{1,2,3}, Qianwen Guo^{1,2,3}, Heng Miao^{1,2,3} Lvzhen Huang^{1,2,3, *}

¹ Department of Ophthalmology, Peking University People's Hospital, Eye Diseases and Optometry Institute, Beijing, 100044, China.

² Beijing Key Laboratory of Diagnosis and Therapy of Retinal and Choroid Diseases, Beijing, 100044, China.

³ College of Optometry, Peking University Health Science Center, Beijing, 100044, China.

Correspondence: Lvzhen Huang, Department of Ophthalmology, Peking University People's Hospital, Eye Diseases and Optometry Institute, Beijing Key Laboratory of Diagnosis and Therapy of Retinal and Choroid Diseases, College of Optometry, Peking University Health Science Center, 100044 Beijing, China;

Email: 2211210291@bjmu.edu.cn

Phone number: +86 15600977321

Table S1. Weighted characteristics of included and excluded participants with diabetes.

Characteristics	Included (n=514)	Excluded (n=2671)
Age, years	60.27 ± 14.14	58.71 ± 14.78
Sex		
Male	274 (53.3)	1350 (50.0)
Female	240 (46.7)	1321 (50.0)
Race		
Non-Hispanic White	186 (59.6)	934 (60.5)
Non-Hispanic Black	147 (17.3)	689 (14.7)
Others	181 (23.2)	1048 (24.8)
BMI, kg/m ²		
<25	60 (10.3)	381 (12.6)
25-30	159 (28.5)	740 (25.8)
≥30	295 (61.2)	1425 (59.4)
Unknown	0 (0.0)	125 (2.2)
Smoking		
Yes	253 (52.1)	1298 (49.7)
No	261 (47.9)	1323 (48.7)
Unknown	0 (0.0)	50 (1.6)
Drinking		
Yes	333 (67.2)	1466 (62.3)
No	181 (32.8)	820 (27.5)
Unknown	0 (0.0)	385 (10.2)
Diabetes duration		
<10 years	259 (50.1)	846 (33.0)
≥10 years	255 (49.9)	799 (28.0)
Unknown	0 (0.0)	1026 (39.0)
Hypertension		
Yes	375 (74.2)	1704 (62.7)
No	139 (25.8)	933 (36.1)
Unknown	0 (0.0)	34 (1.2)

Table S2. Weighted characteristics of Participants stratified by sex.

Characteristics	Males (n=274)	Females (n=240)	P-value
Age, years	61.07 ± 13.13	59.36 ± 15.19	0.136
Race			0.281
Non-Hispanic White	105 (62.0)	81 (56.8)	
Non-Hispanic Black	72 (14.6)	75 (20.4)	
Others	97 (23.5)	84 (22.8)	
BMI, kg/m ²	32.44 ± 7.16	33.60 ± 7.65	0.187
Smoking			<0.001
Yes	154 (61.0)	99 (42.0)	
No	120 (39.0)	141 (58.0)	
Drinking			<0.001
Yes	225 (84.7)	108 (47.1)	
No	49 (15.3)	132 (52.9)	
Diabetes duration			0.550
<10 years	139 (51.8)	120 (48.2)	
≥10 years	135 (48.2)	120 (51.8)	
HbA1c, %	7.56 ± 1.76	7.47 ± 1.83	0.613
Hypertension			0.034
Yes	188 (69.3)	187 (79.8)	
No	86 (30.7)	53 (20.2)	
Total energy intake, kcal/day	2098.16 ± 956.75	1631.38 ± 754.06	<0.001
Caffeine intake, mg/day, Median ± IQR	122.28 ± 219.18	102.17 ± 159.31	0.107
1-methyluric acid (1-MU), Median ± IQR	83.80 ± 140.81	57.85 ± 103.68	0.001
3-methyluric acid (3-MU), Median ± IQR	1.01 ± 1.68	0.69 ± 1.83	0.612
7-methyluric acid (7-MU), Median ± IQR	17.95 ± 40.36	14.88 ± 29.84	0.273
1,3-dimethyluric acid (1,3-DMU), Median ± IQR	9.84 ± 15.30	7.49 ± 13.17	0.049
1,7-dimethyluric acid (1,7-DMU), Median ± IQR	40.77 ± 64.56	32.92 ± 62.46	0.197
3,7-dimethyluric acid (3,7-DMU), Median ± IQR	1.01 ± 1.72	0.77 ± 1.62	0.144
1,3,7-trimethyluric acid (1,3,7-TMU), Median ± IQR	2.23 ± 5.10	1.89 ± 4.14	0.331
1-methylxanthine (1-MX), Median ± IQR	42.80 ± 65.25	19.10 ± 44.05	<0.001
3-methylxanthine (3-MX), Median ± IQR	32.58 ± 54.29	25.26 ± 39.08	0.088
7-methylxanthine (7-MX), Median ± IQR	47.14 ± 93.22	29.79 ± 58.96	0.001
1,3-dimethylxanthine (theophylline), Median ± IQR	1.97 ± 2.95	1.50 ± 2.37	0.098
1,7-dimethylxanthine (paraxanthine), Median ± IQR	20.57 ± 31.53	12.10 ± 21.15	<0.001
3,7-dimethylxanthine (theobromine), Median ± IQR	14.67 ± 18.76	11.52 ± 19.91	0.076
1,3,7-trimethylxanthine (caffeine), Median ± IQR	5.26 ± 11.98	5.56 ± 8.69	0.620
5-acetylamino-6-amino-3-methyluracil (AAMU), Median ± IQR	98.30 ± 181.73	57.73 ± 119.92	0.007