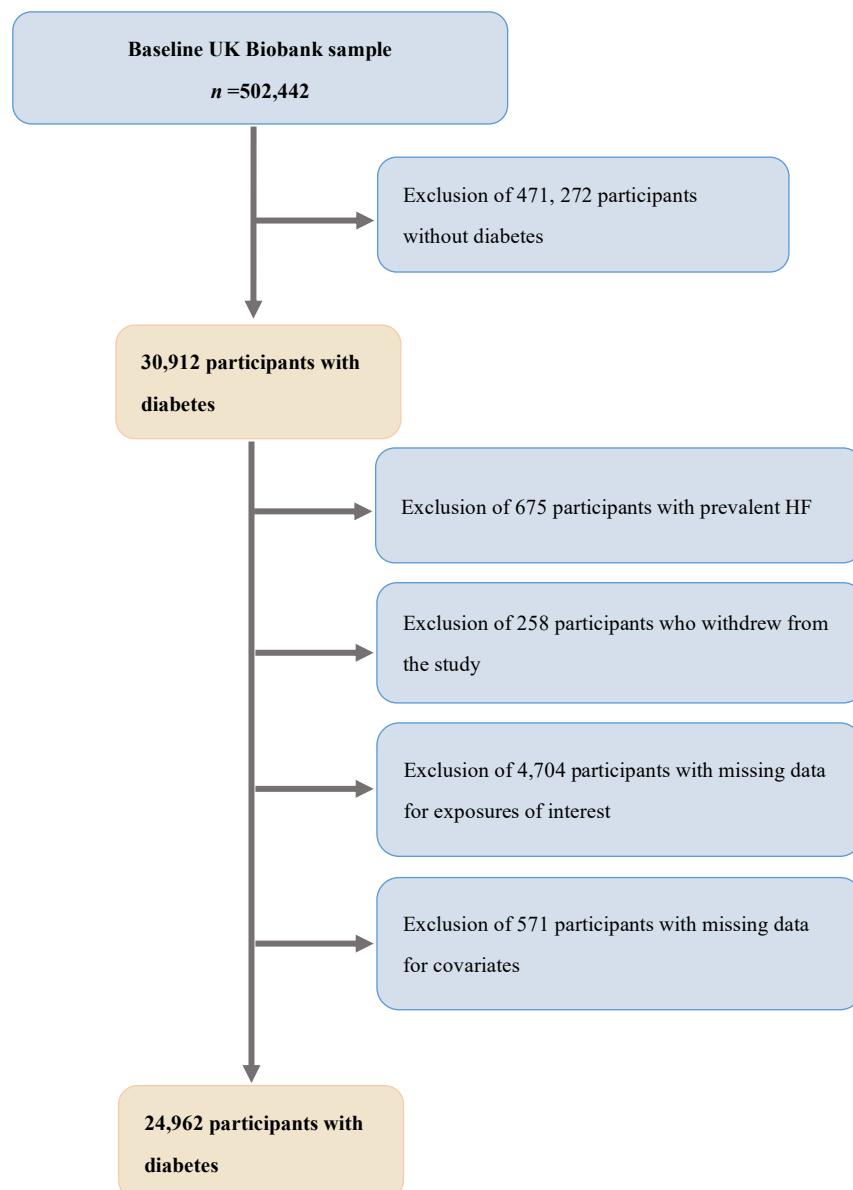


Duration of diabetes, glycemic control, and risk of heart failure among adults with diabetes: a cohort study

Huan-Huan Yang, PhD¹, Fu-Rong Li, PhD^{2,3*}, Ze-Kun Chen, MPH¹, Meng-Ge Zhou, PhD¹, Li-Feng Xie, MSc^{1,4}, Yuan-Yuan Jin, MSN^{1,5}, Zhi-Hui Li, PhD^{1*}, and Guo-Chong Chen, PhD^{6*}

Supplementary Figure 1. Flowchart of the study population selection



Supplementary Table 1. ICD codes used in the UK Biobank study to identify heart failure cases**ICD-9**

Congestive heart failure: 4,280

Left heart failure: 4,281

Heart failure, unspecified: 4,289

ICD-10

Hypertensive heart disease with (congestive) heart failure: I11.0

Hypertensive heart and renal disease with (congestive) heart failure: I13.0

Hypertensive heart and renal disease with both (congestive) heart failure and renal failure: I13.2

Congestive heart failure: I50.0

Left ventricular failure: I50.1

Heart failure, unspecified: I50.9

Self-report*

Non-cancer illness code: 20,002

*20,002 is the data code used in UK Biobank: Non-cancer illness code.

Supplementary Table 2. Baseline participants' characteristics by the levels of HbA1c

	HbA1c levels			
	<53.0mmol/mol	≥53.0 to <58.5mmol/mol	≥58.5 to <63.9mmol/mol	≥63.9mmol/mol
	<7.0%	≥7.0 to <7.5%	≥7.5 to <8.0%	≥8.0%
No. of participants	14,418	3,749	2,314	4,481
Diabetes duration, y	3.0 (1.0-7.0)	5.0 (1.0-11.0)	7.0 (2.0-14.0)	7.0 (2.0-14.0)
HbA1c, mmol/mol	45.9 (41.2-49.5)	55.5 (54.1-56.8)	61.0 (59.6-62.3)	73.2 (67.7-83.4)
HbA1c, %	6.3% (5.9%-6.7%)	7.2% (7.1%-7.3%)	7.7% (7.6%-7.9%)	8.5% (8.3%-9.8%)
Age, y	62.0 (56.0-66.0)	61.0 (56.0-65.0)	61.0 (54.0-65.0)	59.0 (52.0-64.0)
Men, %	9,077 (63.0)	2,396 (63.9)	1,448 (62.6)	2,890 (64.5)
White, %	12,778 (88.6)	3,285 (87.6)	2,038 (88.1)	3,893 (86.9)
Body mass index, kg/m ²	30.5 (27.3-34.4)	30.7 (27.5-34.7)	30.6 (27.5-34.9)	31.0 (27.7-35.1)
Current smoker, %	1,621 (11.2)	407 (10.9)	259 (11.2)	572 (12.8)
SBP, mmHg	143.0 (131.0-156.0)	144.0 (132.0-156.0)	144.0 (132.0-156.0)	143.0 (131.0-156.0)
Antihypertensive medication use, %	8,880 (61.6)	2,293 (61.2)	1,363 (58.9)	2,505 (55.9)
Heart rate	72.0 (64.0-81.0)	74.0 (66.0-84.0)	75.0 (67.0-85.0)	77.0 (69.0-87.0)
History of CHD	2,452 (17.0)	602 (16.1)	377 (16.3)	751 (16.8)

Continuous variables are described as medians (interquartile range), and categorical variables are described as numbers and percentages.

Supplementary Table 3. Associations of diabetes duration with risk of heart failure, by HbA1c levels

	Events/person-y	HR (95% CI)
HbA1c <63.9mmol/mol (8.0%)		
Diabetes duration <5 y	747/121,601	Ref.
Diabetes duration ≥ 5 y to 10 y	423/53,374	1.12 (0.99, 1.26)
Diabetes duration ≥ 10 y to 15 y	231/22,965	1.26 (1.09, 1.47)
Diabetes duration ≥ 15 y	280/25,697	1.55 (1.35, 1.79)
P-trend	-	<0.001
HbA1c ≥ 63.9mmol/mol (8.0%)		
Diabetes duration <5 y	110/18,688	Ref.
Diabetes duration ≥ 5 y to 10 y	124/10,949	1.61 (1.24, 2.10)
Diabetes duration ≥ 10 y to 15 y	94/7,049	1.85 (1.39, 2.46)
Diabetes duration ≥ 15 y	184/11,215	2.53 (1.97, 3.24)
P-trend	-	<0.001

Adjustments were made for age, sex, ethnicity, BMI, smoking status, SBP, antihypertensive medication use, history of CHD, and heart rate.

Supplementary Table 4. Joint associations of glycemic control and diabetes duration with risk of heart failure

	Age stratification (<i>P</i> for interaction = 0.26)			
	Age <60 y		Age ≥60 y	
	Events/person-y	HR (95% CI)	Events/person-y	HR (95% CI)
HbA1c <63.9mmol/mol (8.0%)				
Diabetes duration <5 y	189/53,867	Ref.	558/67,733	Ref.
Diabetes duration ≥5 y to 10 y	60/19,103	0.81 (0.60, 1.08)	363/34,270	1.22 (1.06, 1.39)
Diabetes duration ≥10 y to 15 y	39/6,853	1.37 (0.97, 1.94)	192/16,111	1.28 (1.09, 1.51)
Diabetes duration ≥15 y	37/9,590	1.34 (0.94, 1.91)	243/16,106	1.65 (1.42, 1.93)
HbA1c ≥63.9mmol/mol (8.0%)				
Diabetes duration <5 y	49/10,865	1.34 (0.98, 1.84)	61/7,823	1.03 (0.79, 1.34)
Diabetes duration ≥5 y to 10 y	50/5,863	2.07 (1.51, 2.84)	74/5,085	1.54 (1.21, 1.97)
Diabetes duration ≥10 y to 15 y	37/3,474	2.85 (2.00, 4.07)	57/3,575	1.57 (1.20, 2.07)
Diabetes duration ≥15 y	56/5,642	2.89 (2.14, 3.92)	128/5,572	2.66 (2.19, 3.23)
Sex stratification (<i>P</i> for interaction = 0.37)				
Women		Men		
Events/person-y		Events/person-y	HR (95% CI)	
HbA1c <63.9mmol/mol (8.0%)				
Diabetes duration <5 y	219/48,872	Ref.	528/72,728	Ref.
Diabetes duration ≥5 y to 10 y	120/19,199	1.27 (1.02, 1.59)	303/34,174	1.09 (0.94, 1.25)
Diabetes duration ≥10 y to 15 y	55/7,573	1.44 (1.07, 1.94)	176/15,392	1.25 (1.05, 1.49)
Diabetes duration ≥15 y	70/8,981	1.89 (1.44, 2.48)	210/16,715	1.51 (1.29, 1.78)
HbA1c ≥63.9mmol/mol (8.0%)				
Diabetes duration <5 y	30/6,494	1.26 (0.86, 1.85)	80/12,194	1.11 (0.87, 1.40)
Diabetes duration ≥5 y to 10 y	27/3,685	1.51 (1.01, 2.25)	97/7,264	1.78 (1.43, 2.21)
Diabetes duration ≥10 y to 15 y	27/2,749	1.90 (1.27, 2.84)	67/4,300	1.94 (1.51, 2.51)
Diabetes duration ≥15 y	57/4,627	3.19 (2.37, 4.29)	127/6,588	2.57 (2.12, 3.12)

Adjustments were made for age, sex, ethnicity, BMI, smoking status, SBP, antihypertensive medication use, history of CHD, and heart rate.

Supplementary Table 5. Sensitivity analysis for the joint association of glycemic control and diabetes duration

Exclusion of participants with undiagnosed diabetes		
	Events/person-y	HR (95% CI)
HbA1c <63.9mmol/mol (8.0%)		
Diabetes duration <5 y	587/93,010	Ref.
Diabetes duration ≥5 y to 10 y	423/53,374	1.12 (0.99, 1.27)
Diabetes duration ≥10 y to 15 y	231/22,965	1.29 (1.10, 1.50)
Diabetes duration ≥15 y	280/25,697	1.58 (1.37, 1.83)
HbA1c ≥63.9mmol/mol (8.0%)		
Diabetes duration <5 y	83/10,880	1.29 (1.03, 1.63)
Diabetes duration ≥5 y to 10 y	124/10,949	1.70 (1.40, 2.07)
Diabetes duration ≥10 y to 15 y	94/7,049	1.90 (1.52, 2.36)
Diabetes duration ≥15 y	184/11,215	2.70 (2.29, 3.19)
Exclusion of participants with type 1 diabetes		
	Events/person-y	HR (95% CI)
HbA1c <63.9mmol/mol (8.0%)		
Diabetes duration <5 y	746/121,179	Ref.
Diabetes duration ≥5 y to 10 y	420/52,704	1.13 (1.00, 1.28)
Diabetes duration ≥10 y to 15 y	231/22,463	1.31 (1.13, 1.53)
Diabetes duration ≥15 y	235/17,610	1.58 (1.36, 1.84)
HbA1c ≥63.9mmol/mol (8.0%)		
Diabetes duration <5 y	110/18,582	1.15 (0.94, 1.41)
Diabetes duration ≥5 y to 10 y	124/10,663	1.73 (1.43, 2.10)
Diabetes duration ≥10 y to 15 y	90/6,461	1.89 (1.51, 2.35)
Diabetes duration ≥15 y	122/6,015	2.46 (2.03, 2.98)

Adjustments were made for age, sex, ethnicity, BMI, smoking status, SBP, antihypertensive medication use, history of CHD, and heart rate.