

Supplementary Table 1. Characteristics of the recruited and excluded subjects

	Recruited N = 12,476	Excluded N = 16,514	p
Age, years	47 ± 9	42 ± 13	< 0.001
Sex, male	8,027 (64.3)	9,861 (59.7)	< 0.001
Body mass index	23.1 ± 3.3	22.8 ± 3.6	< 0.001
Obesity*	3,780 (30.3)	4,436 (28.0)	< 0.001
Systolic blood pressure, mmHg	116 ± 16	115 ± 17	< 0.001
Diastolic blood pressure, mmHg	74 ± 11	72 ± 11	< 0.001
Smoking habit	4,362 (35.8)	5,873 (39.1)	< 0.001
Alcohol drinking habit	3,274 (26.2)	3400 (20.6)	< 0.001
Family history of DM	2,174 (17.4)	2,568 (18.0)	0.199
Medications			
Anti-hypertensive drugs	714 (9.9)	255 (6.6)	0.461
Anti-dyslipidemic drugs	1,108 (8.9)	1,315 (9.5)	0.326
Biochemical data			
Albumin, g/dL	4.3 ± 0.2	4.3 ± 0.2	0.116
eGFR, mL/min/1.73m ²	85 ± 13	84 ± 17	< 0.001
Uric acid, mg/dL	5.4 ± 1.4	5.4 ± 1.4	0.111
Fasting glucose, mg/dL	89 ± 9	95 ± 25	< 0.001
HbA1c, %	5.2 ± 0.3	5.7 ± 1.1	< 0.001
AST, U/L	21 (18-26)	20 (17-25)	< 0.001
ALT, U/L	20 (15-30)	19 (14-29)	< 0.001
γGTP, U/L	30 (19-55)	27 (17-49)	< 0.001
Total cholesterol, mg/dL	204 ± 33	199 ± 35	< 0.001
LDL cholesterol, mg/dL	121 ± 30	116 ± 32	< 0.001
HDL cholesterol, mg/dL	61 ± 15	62 ± 16	< 0.001
Triglycerides, mg/dL	91 (63-135)	86 (58-131)	< 0.001
Urine pH	5.9 ± 0.7	6.0 ± 0.7	< 0.001

Variables are expressed as number (%), means ± SD or medians (interquartile ranges).

*Obesity was defined as body mass index ≥ 25.

AST, aspartate aminotransferase; ALT, alanine aminotransferase; γGTP, γ-glutamyl transpeptidase; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; HDL, high-density lipoprotein; LDL, low-density lipoprotein.

Supplementary Table 2. Cox proportional hazard analyses for new onset of DM including liver function as a covariate in males (n = 8,027)

	Model 1		Model 2		Model 3	
	HR (95% CI)	p	HR (95% CI)	p	HR (95% CI)	p
U-pH ≤ 5.0	1.39 (1.07-1.80)	0.011	1.36 (1.05-1.76)	0.016	1.37 (1.06-1.77)	0.015
U-pH = 5.5	1.19 (0.92-1.52)	0.168	1.14 (0.89-1.46)	0.298	1.17 (0.91-1.50)	0.209
U-pH = 6.0	1.08 (0.81-1.43)	0.587	1.05 (0.79-1.38)	0.729	1.04 (0.78-1.37)	0.774
U-pH ≥ 6.5	Reference	-	Reference	-	Reference	-
Age (per 10 years)	1.20 (1.07-1.33)	< 0.001	1.25 (1.12-1.39)	< 0.001	1.20 (1.07-1.25)	< 0.001
Obesity*	1.67 (1.38-2.01)	< 0.001	1.50 (1.23-1.82)	< 0.001	1.71 (1.42-2.00)	< 0.001
Fasting glucose (≥ 100 mg/dL)	9.5 (7.8-11.5)	< 0.001	9.3 (7.7-11.3)	< 0.001	9.3 (7.6-11.3)	< 0.001
Smoking habit	1.78 (1.48-2.13)	< 0.001	1.76 (1.46-2.11)	< 0.001	1.72 (1.43-2.00)	< 0.001
Alcohol drinking habit	0.79 (0.65-0.95)	0.016	0.84 (0.70-1.02)	0.081	0.77 (0.64-0.94)	0.010
Family history of DM	1.42 (1.15-1.74)	< 0.001	1.39 (1.14-1.71)	< 0.001	1.41 (1.15-1.79)	< 0.001
Anti-hypertensive drugs	1.19 (0.92-1.53)	0.174	1.18 (0.92-1.52)	0.182	1.16 (0.90-1.49)	0.243
Anti-dyslipidemic drugs	1.62 (1.17-2.23)	< 0.001	1.65 (1.19-2.28)	< 0.001	1.61 (1.17-2.23)	0.003
AST (per 1 U/L)	1.01 (1.01-1.02)	< 0.001	-	-	-	-
ALT (per 1 U/L)	-	-	1.01 (1.01-1.01)	< 0.001	-	-
γGTP (per 1 U/L)	-	-	-	-	1.00 (1.00-1.01)	< 0.001
	(AIC = 7,770)		(AIC = 7,744)		(AIC = 7,774)	

*Obesity was defined as body mass index ≥ 25.

AIC, Akaike's information criterion; AST, aspartate aminotransferase; ALT, alanine aminotransferase; CI, confidence interval; DM, diabetes mellitus; γGTP, γ-glutamyl transpeptidase; HR, hazard ratio; U-pH, urine pH.

Supplementary Table 3. Cox proportional hazard analyses for new onset of DM including liver function as a covariate in females (n =4,449)

	Model 1		Model 2		Model 3	
	HR (95% CI)	p	HR (95% CI)	p	HR (95% CI)	p
U-pH ≤ 5.0	1.01 (0.61-1.65)	0.963	1.01 (0.62-1.66)	0.949	1.02 (0.62-1.66)	0.936
U-pH = 5.5	1.15 (0.72-1.83)	0.543	1.16 (0.73-1.84)	0.529	1.17 (0.74-1.86)	0.495
U-pH = 6.0	0.99 (0.58-1.69)	0.995	0.99 (0.58-1.69)	0.998	1.01 (0.59-1.71)	0.956
U-pH ≥ 6.5	Reference	-	Reference	-	Reference	-
Age (per 10 years)	1.33 (1.07-1.64)	0.007	1.34 (1.09-1.66)	0.005	1.35 (1.09-1.66)	0.004
Obesity*	2.55 (1.76-3.70)	< 0.001	2.51 (1.71-3.68)	< 0.001	2.59 (1.78-3.76)	< 0.001
Fasting glucose (≥ 100 mg/dL)	12.1 (8.3-17.5)	< 0.001	12.1 (8.4-17.6)	< 0.001	12.3 (8.5-17.8)	< 0.001
Smoking habit	1.38 (0.89-2.14)	0.148	1.38 (0.89-2.15)	0.141	1.38 (0.89-2.14)	0.146
Alcohol drinking habit	0.93 (0.53-1.59)	0.788	0.93 (0.54-1.61)	0.822	0.92 (0.53-1.59)	0.772
Family history of DM	1.74 (1.19-2.55)	0.004	1.74 (1.19-2.55)	0.004	1.73 (1.18-2.54)	0.004
Anti-hypertensive drugs	1.23 (0.74-2.04)	0.423	1.21 (0.73-2.02)	0.445	1.20 (0.72-2.00)	0.466
Anti-dyslipidemic drugs	1.58 (0.87-2.85)	0.128	1.60 (0.88-2.89)	0.117	1.65 (0.91-2.96)	0.093
AST	1.01 (0.99-1.02)	0.206	-	-	-	-
ALT	-	-	1.00 (0.99-1.01)	0.403	-	-
γGTP	-	-	-	-	1.00 (0.99-1.01)	0.809
	(AIC = 1,803)		(AIC = 1,804)		(AIC = 1,804)	

*Obesity was defined as body mass index ≥ 25.

AIC, Akaike's information criterion; AST, aspartate aminotransferase; ALT, alanine aminotransferase; CI, confidence interval; DM, diabetes mellitus; γGTP, γ-glutamyl transpeptidase; HR, hazard ratio; U-pH, urine pH.