

Table 1

General Characteristics of Participants.

Characteristics	Total Participants		
	Osteoporosis (n , %)	Control (n , %)	Standardized Difference
Total number	67,811 (100.0)	67,811 (100.0)	
Age (years old)			0
40–44	1025 (1.5)	1025 (1.5)	
45–49	5110 (7.5)	5110 (7.5)	
50–54	12,051 (17.8)	12,051 (17.8)	
55–59	15,211 (22.4)	15,211 (22.4)	
60–64	13,563 (20.0)	13,563 (20.0)	
65–69	7263 (10.7)	7263 (10.7)	
70–74	6944 (10.2)	6944 (10.2)	
75–79	4458 (6.6)	4458 (6.6)	
80–84	1826 (2.7)	1826 (2.7)	
85+	360 (0.5)	360 (0.5)	
Sex			0
Male	12,306 (18.2)	12,306 (18.2)	
Female	55,505 (81.9)	55,505 (81.9)	
Income			0
1 (lowest)	12,855 (19.0)	12,855 (19.0)	
2	10,246 (15.1)	10,246 (15.1)	
3	11,083 (16.3)	11,083 (16.3)	
4	13,786 (20.3)	13,786 (20.3)	
5 (highest)	19,841 (29.3)	19,841 (29.3)	
Region of residence			0
Urban	28,576 (42.1)	28,576 (42.1)	
Rural	39,235 (57.9)	39,235 (57.9)	
Obesity †			0.18
Underweight	2400 (3.5)	1632 (2.4)	
Normal	27,361 (40.4)	23,234 (34.3)	
Overweight	17,731 (26.2)	17,716 (26.1)	
Obese I	18,530 (27.3)	22,309 (32.9)	
Obese II	1789 (2.6)	2920 (4.3)	
Smoking status			0.5
Nonsmoker	60,277 (88.9)	59,566 (87.8)	
Past smoker	3451 (5.1)	3572 (5.3)	
Current smoker	4083 (6.0)	4673 (6.9)	
Alcohol consumption			0.05
<1 time a week	56,281 (83.0)	55,306 (81.6)	
≥1 time a week	11,530 (17.0)	12,505 (18.4)	
Systolic blood pressure			0.13
<120 mmHg	23,007 (33.9)	20,459 (30.2)	
120–139 mmHg	30,208 (44.6)	29,831 (44.0)	
≥140 mmHg	14,596 (21.5)	17,521 (25.8)	
Diastolic blood pressure			0.11
<80 mmHg	34,028 (50.2)	31,177 (46.0)	

80–89 mmHg	22,243 (32.8)	22,738 (33.5)	
≥90 mmHg	11,540 (17.0)	13,896 (20.5)	
Fasting blood glucose			0.13
<100 mg/dL	47,274 (69.7)	43,952 (64.8)	
100–125 mg/dL	16,240 (24.0)	17,471 (25.8)	
≥126 mg/dL	4297 (6.3)	6388 (9.4)	
Total cholesterol			0.04
<200 mg/dL	33,542 (49.5)	32,588 (48.1)	
200–239 mg/dL	23,440 (34.6)	23,523 (34.7)	
≥240 mg/dL	10,829 (16.0)	11,700 (17.3)	
CCI score			0.13
0	37,311 (55.0)	40,827 (60.2)	
1	12,535 (18.5)	10,550 (15.6)	
≥2	17,965 (26.5)	16,434 (24.2)	
Renal stone	2276 (3.4)	1696 (2.5)	0.05

Abbreviation: CCI, Charlson comorbidity index; † Obesity (BMI, body mass index, kg/m²) was categorized as <18.5 (underweight), ≥18.5 to <23 (normal), ≥23 to <25 (overweight), ≥25 to <30 (obese I), and ≥30 (obese II).

Table 2

Crude and adjusted hazard ratios of osteoporosis for renal stones by subgroup according age, sex, income, and region.

Independent Variables	IR per 1000 Person-Year	IRD per 1000 Person-Years (95% CI)	Hazard Ratios for Renal Stone (95% Confidence Interval)			
			Crude †	p Value	Adjusted †,‡	p Value
Total participants (n = 135,622)						
Osteoporosis	3.2	0.70 (0.52 to 0.88)	1.30 (1.22 to 1.39)	<0.001 *	1.36 (1.28 to 1.45)	<0.001 *
Control	2.5		1		1	
Age < 60 (n =66,794)						
Osteoporosis	3.7	0.93 (0.68 to 1.19)	1.34 (1.24 to 1.46)	<0.001 *	1.41 (1.29 to 1.53)	<0.001 *
Control	2.7		1		1	
Age ≥ 60 (n = 68,828)						
Osteoporosis	2.3	−0.46 (−0.70 to −0.21)	1.24 (1.12 to 1.37)	<0.001 *	1.30 (1.17 to 1.44)	<0.001 *
Control	2.7		1		1	
Men (n = 24,612)						
Osteoporosis	4	0.54 (−0.04 to 1.12)	1.17 (1.00 to 1.37)	0.044 *	1.37 (1.15 to 1.64)	0.001 *
Control	3.4		1		1	
Women (n = 111,010)						
Osteoporosis	3.1	0.72 (0.53 to 0.91)	1.33 (1.24 to 1.42)	<0.001 *	1.36 (1.27 to 1.46)	<0.001 *
Control	2.4		1		1	
Low income (n = 68,368)						
Osteoporosis	3.1	0.77 (0.52 to 1.01)	1.35 (1.24 to 1.48)	<0.001 *	1.38 (1.26 to 1.51)	<0.001 *
Control	2.4		1		1	
High income (n = 67,254)						
Osteoporosis	3.3	0.63 (0.37 to 0.89)	1.25 (1.15 to 1.37)	<0.001 *	1.29 (1.18 to 1.41)	<0.001 *
Control	2.7		1		1	
Urban residents (n = 57,152)						
Osteoporosis	3.2	0.67 (0.40 to 0.94)	1.33 (1.24 to 1.42)	<0.001 *	1.31 (1.19 to 1.44)	<0.001 *
Control	2.5		1		1	
Rural residents (n = 78,470)						
Osteoporosis	0.1	−0.18 (−0.23 to −0.12)	1.28 (1.16 to 1.41)	<0.001 *	1.35 (1.24 to 1.47)	<0.001 *
Control	0.2		1		1	

Abbreviations; IR, incidence rate; IRD, incidence rate difference; * Stratified Cox proportional hazard regression model, Significance at $p < 0.05$; † Models were stratified by age, sex, income, and region of residence. ‡ The model was adjusted for obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, and CCI scores.

Table 3

General Characteristics of Participants.

Characteristics	Total Participants		
	Renal Stone (n, %)	Control (n, %)	Standardized Difference
Total number	25,261 (100.0)	101,044 (100.0)	
Age (years old)			0
40–44	1162 (4.6)	4648 (4.6)	
45–49	3498 (13.9)	13,992 (13.9)	
50–54	5134 (20.3)	20,536 (20.3)	
55–59	5557 (22.0)	22,228 (22.0)	
60–64	4289 (17.0)	17,156 (17.0)	
65–69	2738 (10.8)	10,952 (10.8)	
70–74	1651 (6.5)	6604 (6.5)	
75–79	857 (3.4)	3428 (3.4)	
80–84	289 (1.1)	1156 (1.1)	
85+	86 (0.3)	344 (0.3)	
Sex			0
Male	18,200 (72.1)	72,800 (72.1)	
Female	7061 (28.0)	28,244 (28.0)	
Income			0
1 (lowest)	3428 (13.6)	13,712 (13.6)	
2	2950 (11.7)	11,800 (11.7)	
3	3916 (15.5)	15,664 (15.5)	
4	5528 (21.9)	22,112 (21.9)	
5 (highest)	9439 (37.4)	37,756 (37.4)	
Region of residence			0
Urban	11,219 (44.4)	44,876 (44.4)	
Rural	14,042 (55.6)	56,168 (55.6)	
Obesity †			0.18
Underweight	309 (1.2)	2063 (2.0)	
Normal	6969 (27.6)	34,846 (34.5)	
Overweight	7322 (29.0)	28,527 (28.2)	
Obese I	9729 (38.5)	32,905 (32.6)	
Obese II	932 (3.7)	2703 (2.7)	
Smoking status			0.14
Nonsmoker	15,012 (59.4)	67,025 (66.3)	
Past smoker	4800 (19.0)	16,222 (16.1)	
Current smoker	5449 (21.6)	17,797 (17.6)	
Alcohol consumption			0.07
<1 time a week	15,185 (60.1)	64,127 (63.5)	
≥1 time a week	10,076 (39.9)	36,917 (36.5)	
Systolic blood pressure			0.02
<120 mmHg	7180 (28.4)	30,437 (30.1)	
120–139 mmHg	13,006 (51.5)	50,408 (49.9)	
≥140 mmHg	5075 (20.1)	20,199 (20.0)	
Diastolic blood pressure			0.03
<80 mmHg	10,932 (43.3)	45,395 (44.9)	

80–89 mmHg	9652 (38.2)	37,229 (36.8)	
≥90 mmHg	4677 (18.5)	18,420 (18.2)	
Fasting blood glucose			0.04
<100 mg/dL	14,854 (58.8)	61,919 (61.3)	
100–125 mg/dL	7698 (30.5)	29,732 (29.4)	
≥126 mg/dL	2709 (10.7)	9393 (9.3)	
Total cholesterol			0.04
<200 mg/dL	13,284 (52.6)	55,208 (54.6)	
200–239 mg/dL	8454 (33.5)	33,059 (32.7)	
≥240 mg/dL	3523 (14.0)	12,777 (12.6)	
CCI score			0.15
0	15,210 (60.2)	67,732 (67.0)	
1	4452 (17.6)	14,943 (14.8)	
≥2	5599 (22.2)	18,369 (18.2)	
Osteoporosis	2319 (9.2)	7658 (7.6)	0.06

Abbreviation: CCI, Charlson comorbidity index; † Obesity (BMI, body mass index, kg/m²) was categorized as <18.5 (underweight), ≥18.5 to <23 (normal), ≥23 to <25 (overweight), ≥25 to <30 (obese I), and ≥30 (obese II).

Table 4

Crude and adjusted hazard ratios of renal stones for osteoporosis stratified by age, sex, income, and region.

Independent Variables	IR per	IRD per 1000	Hazard Ratios for Osteoporosis			
	1000 Person-Year	Person-Years (95% CI)	(95% Confidence Interval)			
			Crude †	<i>p</i> Value	Adjusted †,‡	<i>p</i> Value
Total participants (<i>n</i> = 126,305)						
Renal stone	11.3	1.98 (1.50 to 2.46)	1.24 (1.18 to 1.29)	<0.001 *	1.26 (1.21 to 1.32)	<0.001 *
Control	9.3		1		1	
Age < 60 (<i>n</i> = 76,755)						
Renal stone	7.8	1.55 (1.09 to 2.01)	1.28 (1.20 to 1.37)	<0.001 *	1.31 (1.23 to 1.40)	<0.001 *
Control	6.2		1		1	
Age ≥ 60 (<i>n</i> = 49,550)						
Renal stone	20.4	3.00 (1.77 to 4.22)	1.19 (1.12 to 1.28)	<0.001 *	1.22 (1.14 to 1.30)	<0.001 *
Control	17.4		1		1	
Men (<i>n</i> = 91,000)						
Renal stone	3.5	0.80 (0.50 to 1.10)	1.29 (1.17 to 1.42)	<0.001 *	1.38 (1.25 to 1.53)	0.001 *
Control	2.7		1		1	
Women (<i>n</i> = 35,305)						
Renal stone	34.4	6.41 (4.77 to 8.05)	1.22 (1.16 to 1.29)	<0.001 *	1.24 (1.17 to 1.30)	<0.001 *
Control	28		1		1	
Low income (<i>n</i> = 51,470)						
Renal stone	14.3	2.92 (2.07 to 3.76)	1.29 (1.21 to 1.38)	<0.001 *	1.32 (1.23 to 1.41)	<0.001 *
Control	11.4		1		1	
High income (<i>n</i> = 74,835)						
Renal stone	9.3	1.39 (0.82 to 1.95)	1.19 (1.11 to 1.27)	<0.001 *	1.21 (1.14 to 1.30)	<0.001 *
Control	8		1		1	
Urban residents (<i>n</i> = 56,095)						
Renal stone	10.6	2.31 (1.64 to 2.98)	1.30 (1.21 to 1.40)	<0.001 *	1.33 (1.24 to 1.43)	<0.001 *
Control	8.3		1		1	
Rural residents (<i>n</i> = 70,210)						
Renal stone	11.9	1.70 (1.02 to 2.37)	1.28 (1.12 to 1.26)	<0.001 *	1.22 (1.14 to 1.29)	<0.001 *
Control	10.2		1		1	

Abbreviations; IR, incidence rate; IRD, incidence rate difference; * Stratified Cox proportional hazard regression model, Significance at $p < 0.05$. † Models were stratified by age, sex, income, and region of residence. ‡ The model was adjusted for obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, and CCI scores.