|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table S1. Risks of albuminuria according to redefined vitamin D status** | | | | | | | | | | | |  |  |  |
| **Vitamin D status1** | | **Total** | **Albuminuria** | **Unadjusted model** | |  | **Adjusted model 1** | |  | **Adjusted model 2** | |  | **Adjusted model 3** | |
| **(n)** | **(n)** | **OR (95% CI)** | ***p-*value** |  | **OR (95% CI)** | ***p-*value** |  | **OR (95% CI)** | ***p-*value** |  | **OR (95% CI)** | ***p-*value** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 2,800 | 252 | Reference |  |  | Reference |  |  | Reference |  |  | Reference |  |
|  | Vitamin D insufficiency | 6,369 | 471 | 0.71 (0.42-1.19) | 0.192 |  | 0.99 (0.56-1.73) | 0.957 |  | 1.02 (0.56-1.85) | 0.958 |  | 1.02 (0.56-1.84) | 0.959 |
|  | Vitamin D deficiency | 654 | 57 | 0.91 (0.48-1.75) | 0.780 |  | 1.57 (0.79-3.13) | 0.198 |  | 1.59 (0.76-3.30) | 0.218 |  | 1.59 (0.77-3.30) | 0.211 |
| **Male** | |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 1,511 | 122 | Reference |  |  | Reference |  |  | Reference |  |  | Reference |  |
|  | Vitamin D insufficiency | 2,698 | 185 | 0.80 (0.60-1.08) | 0.144 |  | 1.15 (0.83-1.60) | 0.392 |  | 1.18 (0.85-1.64) | 0.324 |  | 1.16 (0.84-1.61) | 0.367 |
|  | Vitamin D deficiency | 192 | 18 | 1.26 (0.62-2.56) | 0.515 |  | 2.44 (1.16-5.15) | 0.019 |  | 2.07 (0.96-4.45) | 0.062 |  | 2.06 (0.94-4.53) | 0.071 |
| **Female** | |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 1,289 | 130 | Reference |  |  | Reference |  |  | Reference |  |  | Reference |  |
|  | Vitamin D insufficiency | 3,671 | 286 | 0.67 (0.51-0.89) | 0.005 |  | 0.94 (0.69-1.27) | 0.672 |  | 0.93 (0.68-1.28) | 0.666 |  | 0.93 (0.68-1.27) | 0.649 |
|  | Vitamin D deficiency | 462 | 39 | 0.82 (0.51-1.30) | 0.393 |  | 1.37 (0.83-2.24) | 0.217 |  | 1.31 (0.77-2.23) | 0.312 |  | 1.29 (0.75-2.20) | 0.352 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OR, odds ratio; CI, confidence interval; eGFR, estimated glomerular filtration rate; Vit D, vitamin D.  1Vit D insufficiency was defined as serum Vit D levels of 10-20 ng/dL; Vit D deficiency was defined as serum Vit D levels of ≤10 ng/dL. Adjusted model 1 : adjusted for age, body mass index, rural area, latitude and occupation + sex (when estimating in total population) Adjusted model 2 : adjusted for age, body mass index, rural area, latitude, occupation, eGFR, systolic blood pressure, diastolic blood pressure, total-cholesterol, triglyceride  and medication (hypertension, diabetes mellitus, dyslipidemia) + sex (when estimating in total population) Adjusted model 3 : adjusted for age, body mass index, rural area, latitude, occupation, eGFR, systolic blood pressure, diastolic blood pressure, total-cholesterol,  triglyceride, and medication (hypertension, diabetes mellitus, dyslipidemia), smoking status, drinking status, regular walking and sun exposure + sex  (when estimating in total population) | | | | | | | | | | | | | | |

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| **Table S2. Risks of albuminuria according to vitamin D status by renal function** | | | | | | | | | | |
| **Vitamin D status1** | | **Normal eGFR2** | | | |  | **Decreased eGFR3** | | | |
| **Total  (n)** | **Albuminuria  (n)** | **OR (95% CI)** | ***p-*value** |  | **Total  (n)** | **Albuminuria  (n)** | **OR (95% CI)** | ***p-*value** |
|  |  |  |  |  |  |  |  |  |  |  |
| **Total** | |  |  |  |  |  |  |  |  |  |
|  | Normal | 2,670 | 209 | Reference |  |  | 130 | 43 | Reference |  |
|  | Vitamin D insufficiency | 5,175 | 334 | 1.03 (0.80-1.33) | 0.810 |  | 170 | 55 | 0.68 (0.35-1.32) | 0.252 |
|  | Vitamin D deficiency | 1,631 | 122 | 1.52 (1.06-2.18) | 0.024 |  | 47 | 17 | 0.66 (0.25-1.73) | 0.392 |
| **Male** | |  |  |  |  |  |  |  |  |  |
|  | Normal | 1,441 | 96 | Reference |  |  | 70 | 26 | Reference |  |
|  | Vitamin D insufficiency | 2,269 | 131 | 1.15 (0.79-1.68) | 0.475 |  | 83 | 27 | 0.61 (0.25-1.49) | 0.272 |
|  | Vitamin D deficiency | 519 | 40 | 1.98 (1.15-3.40) | 0.014 |  | 19 | 5 | 0.51 (0.12-2.22) | 0.363 |
| **Female** | |  |  |  |  |  |  |  |  |  |
|  | Normal | 1,229 | 113 | Reference |  |  | 60 | 17 | Reference |  |
|  | Vitamin D insufficiency | 2,906 | 203 | 0.91 (0.64-1.28) | 0.581 |  | 87 | 28 | 0.87 (0.32-2.34) | 0.778 |
|  | Vitamin D deficiency | 1,112 | 82 | 1.19 (0.76-1.86) | 0.443 |  | 28 | 12 | 0.62 (0.15-2.60) | 0.510 |
|  |  |  |  |  |  |  |  |  |  |  |
| OR, odds ratio; CI, confidence interval; eGFR, estimated glomerular filtration rate; Vit D, vitamin D.  All of analysis here were adjusted for age, body mass index, rural area, latitude, occupation, eGFR, systolic blood pressure, diastolic blood pressure, total-cholesterol, triglyceride, medication (hypertension, diabetes mellitus, dyslipidemia), smoking status, drinking status, regular walking and sun exposure + sex (when estimating in total population) 1Vit D insufficiency was defined as serum Vit D levels of 12-20 ng/dL; Vit D deficiency was defined as serum Vit D levels of ≤12 ng/dL  2 Over 60 ml/min/1.73m2  was considered as normal eGFR. 3Below 60 ml/min/1.73m2 was considered as decreased eGFR. | | | | | | | | | | |

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| **Table S3. Risks of albuminuria according to vitamin D status by obesity** | | | | | | | | | | | | |
| **Vitamin D status1** | | **Underweight2** | | |  | **Normal** | | |  | **Obese state3** | | |
| **Albuminuria / Total (n)** | **OR (95% CI)** | ***p-*value** |  | **Albuminuria / Total (n)** | **OR (95% CI)** | ***p-*value** |  | **Albuminuria / Total (n)** | **OR (95% CI)** | ***p-*value** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 10/88 | Reference |  |  | 131/1,786 | Reference |  |  | 111/926 | Reference |  |
|  | Vitamin D insufficiency | 8/191 | 1.55 (0.45-5.33) | 0.488 |  | 197/3,313 | 1.14 (0.84-1.55) | 0.411 |  | 184/1,841 | 0.88 (0.62-1.24) | 0.460 |
|  | Vitamin D deficiency | 3/108 | 0.56 (0.10-3.20) | 0.513 |  | 77/1,091 | 1.72 (1.12-2.64) | 0.014 |  | 59/479 | 1.28 (0.80-2.05) | 0.309 |
| **Male** | |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 2/43 | Reference |  |  | 61/956 | Reference |  |  | 59/512 | Reference |  |
|  | Vitamin D insufficiency | 5/52 | 25.37 (0.19-999.9) | 0.190 |  | 86/1,437 | 1.49 (0.92-2.42) | 0.104 |  | 67/863 | 0.75 (0.45-1.26) | 0.274 |
|  | Vitamin D deficiency | 1/25 | 3.20 (0.03-999.9) | 0.630 |  | 27/333 | 2.64 (1.28-5.41) | 0.009 |  | 17/180 | 1.11 (0.54-2.30) | 0.770 |
| **Female** | |  |  |  |  |  |  |  |  |  |  |  |
|  | Normal | 8/45 | Reference |  |  | 70/830 | Reference |  |  | 52/414 | Reference |  |
|  | Vitamin D insufficiency | 3/139 | 1.47 (0.18-11.79) | 0.718 |  | 111/1,876 | 0.83 (0.55-1.25) | 0.374 |  | 117/978 | 1.03 (0.64-1.68) | 0.897 |
|  | Vitamin D deficiency | 2/83 | 1.29 (0.18-9.05) | 0.799 |  | 50/758 | 1.16 (0.71-1.89) | 0.560 |  | 42/299 | 1.36 (0.71-2.61) | 0.355 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| OR, odds ratio; CI, confidence interval; eGFR, estimated glomerular filtration rate; Vit D, vitamin D.  All of analysis here were adjusted for age, body mass index, rural area, latitude, occupation, eGFR, systolic blood pressure, diastolic blood pressure, total-cholesterol, triglyceride, medication (hypertension, diabetes mellitus, dyslipidemia), smoking status, drinking status, regular walking and sun exposure + sex (when estimating in total population) 1Vit D insufficiency was defined as serum Vit D levels of 12-20 ng/dL; Vit D deficiency was defined as serum Vit D levels of ≤12 ng/dL  2 Body mass index below 18.5kg/m2 was considered as underweight. 3 Body mass index over 23.5kg/m2 was considered as obese state | | | | | | | | | | | | |