**Supplementary file**

**Supplementary Table 1.** Characteristics of the study participants across tertiles of 25(OH)D (ng/ml) and 1.25(OH)2D(ng/ml) according to the the DASH score

|  |  |  |
| --- | --- | --- |
|  |  25 (OH)D  |  1,25 (OH)D  |
|  | **T1 (n=33)** | **T2 (n=40)** | **T3 (n=34)** | **P trend\*\*** | **T1 (n=57)** | **T2 (n=50)** | **T3 (n=56)** | **P trend\*\*** |
| DASH< 24 |  |  |  | **N(%)** |  |  |  |  |
| Sex (%men)  | 23 (40.4) | 24 (48%) | 22 (31.9%) | 0.61 | 22 (39.3%) | 32 (52.5%) | 15 (32.6%) | 0.10 |
| Physical activity (%) |  | 0.09 |  | 0.09 |
| Low | 15 (26.8%) | 25 (51%) | 20 (35.7%) |  | 15 (26.8%) | 25 (51%) | 20 (35.7%) |  |
| Moderate  | 30 (53.6%) | 15 (30.6%) | 23 (41.1%) |  | 30 (53.6%) | 15 (30.6%) | 23 (41.1%) |  |
| High | 11 (19.6%) | 9 (18.4%) | 13 (23.2) |  | 11 (19.6%) | 9 (18.4%) | 13 (23.2%) |  |
| Smoking status (%) |  | 0.19 |  | 0.19 |
| Non | 51 (89.5%) | 40 (80%) | 51 (91%) |  | 51 (89.5%) | 40 (80%) | 51 (91.1%) |  |
| Current  | 6 (10.5%) | 10 (20%) | 5 (8.9%) |  | 6 (10.5%) | 10 (20%) | 5 (8.9%) |  |
| Education (%) |  | 0.48 |  | 0.49 |
| Under diploma | 4 (7%) | 3 (6%) | 4 (7.2%) |  | 3 (5.4%) | 4 (6.6%) | 4 (8.7%) |  |
| Diploma and upper | 53 (93%) | 47 (94%) | 52 (92.9%) |  | 53 (94.6%) | 57 (93.4%) | 42 (91.3%) |  |
| Marital status (%married) | 28 (49.1%) | 27 (54%) | 29 (51.8%) | 0.70 | 25 (49.1%) | 27 (54%) | 29 (51.8%) | 0.63 |
| Occupation | 0.12 |  | 0.93 |
| Employee | 31 (34.4%) | 38 (42.2%) | 21 (23.3%) |  | 31 (34.4%) | 26 (28.9%) | 33 (36.7%) |  |
| Housekeeper | 5 (22.7%) | 6 (27.3%) |  11 (50%) |  | 7 (31.8%) | 6 (27.3%)  | 9 (40.9%) |  |
| Retired | 1 (12.5%) | 4 (50%) | 3 (37.5%) |  | 3 (37.5%) | 3 (37.5%) | 2 (25%) |  |
| Unemployed | 19 (44.2%) | 13 (30.2%) | 11 (25.6%) |  | 16 (37.2%) | 15 (34.9%) | 12 (27.9%) |  |
|  |  |  | Mean SD |  |  |  |  |  |
| Age (years) | 31.7 | 9.91 | 36.1 | 13.1 | 35.5 | 12.6 | 0.13 | 34.8 | 12.6 | 34.2 | 12.4 | 34.1 | 11.2 | 0.94 |
| BMI (kg/m2) | 23.8 | 4.45 | 26.1 | 4.86 | 25.9 | 5.04 | **0.05** | 24.6 | 4.86 | 26.5 |  6.02 | 24.8  | 4.05 | 0.11 |
| Weight (kg) | 68.0 | 17.0 | 74.8  | 17.9 | 72.1 |  14.8 | 0.09 | 69.4 | 17.8 | 76.1 | 18.5 | 70.2 |  13.8 | 0.09 |
| Height (cm) | 168 | 10.2 | 168 | 10.1 | 166 | 8.83 | 0.52 | 167 | 9.98 | 169 | 8.48 | 167 | 10.7 | 0.51 |
| Fat mass (kg) | 20.2  | 8.79 | 22.8 | 9.74 | 23.7 | 10.9 | 0.16 | 21.0 | 9.33 | 24.6 | 11.7 | 21.1 | 8.03 | 0.13 |
| Fat free mass (kg) | 47.9 | 12.8 | 52.0 | 12.8 | 48.8 | 9.86 | 0.18 | 48.3 | 12.8 | 51.6 | 11.5 | 49.0 | 11.9 | 0.33 |
| WC (cm) | 85.8 | 13.6 | 91.1 | 13.6 | 89.5  | 12.1 | 0.09 | 87.1 | 13.2 | 92.1 | 14.8 | 87.6  | 11.6 | 0.12 |
| FBS (mg/dL) | 96.5 | 11.0 | 96.0 | 10.1 | 103  | 37.0 | 0.20 | 100 | 33.1 | 98.0  | 12.4 | 96.2  | 10.7 | 0.58 |
| TG (mg/dL) | 110 | 71.3 | 122  | 71.5 | 120  | 65.8 | 0.63 | 119  | 74.2 | 131 | 75.1 | 105  | 57.5 | 0.13 |
| HDL-c (mg/dL) | 49.2 | 9.81 | 47.5  |  10.5 | 51.1  | 11.8 | 0.18 | 48.7  | 11.2 | 47.1  | 10.0 | 51.3  | 10.5 | 0.09 |
| DBP (mm Hg) | 69.0 | 7.25 | 72.7  | 9.85 | 70.5  | 8.59 | 0.08 | 70.4  | 9.35 | 71.5 |  8.38 | 70.6  | 8.76 | 0.77 |
| SBP(mm Hg) | 109  | 9.66 | 114  | 13.2 | 111 | 13.8 | **0.05** | 109  | 12.2 | 112 | 11.8 | 113 |  13.1 | 0.34 |
| VO2max (mL/kg/min) | 31.5 | 6.72 | 31.0  | 6.65 | 31.1  | 8.84 | 0.96 | 31.0  | 6.31 | 30.8 |  7.60 | 31.7 | 7.66 | 0.80 |
| 1,25(OH)D (ng/mL) | 46.1 | **36.54** | 52.4  | **39.6** | 61.4  | **48.3** | 0.6 | **21.6**  | **3.66** | **32.7** | **5.33** | **55.8** | **17.4** | **<0.001** |
| 25(OH)D (ng/mL) | **9.63** | **2.14** | **17.8**  | **2.46** | **34.2**  | **12.7** | **<0.001** | 18.2  | 12.6 | 19.0 | **11.9** | 21.5 | **11.4** | 0.15 |
| DASH> 24 |  |  |  | **N(%)** |  |  |  |  |
| Sex (%men)  | 14 (43.8%) | 18 (45%) | 17 (53.1%) | 0.71 | 16 (53.3%) | 17 (56.7%) | 16 (36.4%) | 0.16 |
| Physical activity (%) |  | 0.33 |  | 0.33 |
| Low | 16 (50%) | 10 (27%) | 11 (34.4%) |  | 16 (50%) | 10 (27%) | 11 (34.4%) |  |
| Moderate  | 12 (37.5%) | 17 (45.9%) | 14 (43.8%) |  | 12 (37.5%) | 17 (45.9%) | 14 (43.8%) |  |
| High | 4 (12.5%) | 10 (27%) | 7 (21.9%) |  | 4 (12.5%) | 10 (27%) | 7 (21.9%) |  |
| Smoking status (%) |  | 0.60 |  | 0.60 |
| Non | 27 (84.4%) | 33 (82.5%) | 29 (90.6%) |  | 27 (84.4%) | 33 (82.5%) | 29 (90.6%) |  |
| Current  | 5 (15.6%) | 7 (17.5%) | 3 (9.4%) |  | 5 (15.6%) | 7 (17.5%) | 3 (9.4%) |  |
| Education (%) |  | 0.48 |  | 0.90 |
| Under diploma | 5 (15.6%) | 3 (7.5%) | 2 (6.3%) |  | 3 (10%) | 2 (6.7%) | 5 (11.4%0 |  |
| Diploma and upper | 27 (84.4%) | 37 (92.5%) | 30 (93.8%) |  | 27 (90%) | 27 (93.3%) | 39 (88.6%) |  |
| Marital status (%married) | 20 (62.5%) | 23 (57.5%) | 16 (50%) | **0.01** | 20 (62.5%) | 23 (57.5%) | 16 (50%) | 0.33 |
| Occupation |  | **0.04** |  | 0.49 |
| Employee | 17 (32.7%) | 18 (34.6%) | 17 (32.7%) |  | 15 (28.8%) | 20 (38.5%) | 17 (32.7%) |  |
| Housekeeper | 3 (13.6%) | 5 (22.7%) | 14 (63.6%) |  | 8 (36.4%) | 11 (50%) | 3 (13.6%) |  |
| Retired | 2 (14.3%) | 3 (21.4%) | 9 (64.3%) |  | 3 (21.4%) | 5 (35.7%) | 6 (42.9%) |  |
| Unemployed | 8 (50%) | 4 (25%) | 4 (25%) |  | 6 (37.5%) | 4 (25%) | 6 (37.5%) |  |
|  |  |  | Mean SD |  |  |  |  |  |
| Age (years) | 35.5 | 12.6 | 37.5 | 14.1 | 45.4 | 13.7 | **0.05** | 42.1 | 14.2 | 40.6 | 13.8 | 38.0 | 14.5 | 0.44 |
| BMI (kg/m2) | 24.9 | 4.12 | 25.8 | 4.48 | 26.9 | 3.50 | 0.10 | 25.4 | 4.26 | 26.8 | 3.92 | 25.7 | 3.90 | 0.33 |
| Weight (kg) | 73.3 | 17.1 | 74.7 | 12.4 | 73.7 | 12.7 | 0.91 | 72.4 | 15.2 | 74.8 | 13.1 | 74.2 | 13.8 | 0.75 |
| Height (cm) | 170 | 9.25 | 169 | 10.1 | 168 | 10.0 | 0.07 | 168 | 9.26 | 166 | 10.8 | 169 | 9.80 | 0.53 |
| Fat mass (kg) | 20.3 | 7.46 | 22.4 | 8.66 | 24.5 | 9.37 | 0.11 | 22.5 | 8.68 | 22.9 | 9.45 | 22.5 | 8.30 | 0.98 |
| Fat free mass (kg) | 53.0 | 14.3 | 52.2 | 11.1 | 49.2 | 11.1 | 0.40 | 49.8 | 11.1 | 51.8 | 12.6 | 51.6 | 12.7 | 0.75 |
| WC (cm) | 88.8 | 12.3 | 90.6 | 9.96 | 91.7 | 11.1 | 0.54 | 89.8 | 12.3 | 91.0 | 11.0 | 90.5 | 11.1 | 0.88 |
| FBS (mg/dL) | 98.4 | 9.74 | 95.5 | 7.81 | 100 | 17.6 | 0.22 | 98.2 | 10.7 | 99.3 | 15.7 | 98.2 | 12.7 | 0.94 |
| TG (mg/dL) | 116 | 59.5 | 137 | 96.0 | 121 | 70.3 | 0.36 | 114 | 82.7 | 126 | 73.4 | 122 | 52.2 | 0.75 |
| HDL-c (mg/dL) | 51.5 | 11.3 | 48.7 | 10.3 | 51.7 | 10.0 | 0.45 | 55.2 | 12.7 | 48.8 | 8.73 | 50.1 | 8.75 | 0.10 |
| DBP (mm Hg) | 71.1 | 7.25 | 71.7 | 9.81 | 71.1 | 10.7 | 0.96 | 73.5 | 9.54 | 70.2 | 9.54 | 70.3 | 9.29 | 0.32 |
| SBP(mm Hg) | 116 | 12.4 | 115 | 13.9 | 115 | 15.3 | 0.88 | 118 | 17.1 | 114 | 13.1 | 114 | 11.5 | 0.36 |
| VO2max (mL/kg/min) | 32.5 | 7.39 | 34.3 | 7.35 | 29.6 | 8.64 | 0.62 | 30.2 | 7.32 | 31.5 | 8.96 | 33.6 | 7.67 | 0.19 |
| 1,25(OH)D (ng/mL) | 52.1 | **43.1** | 52.5 | **44.3** | 50.0 | **37.9** | 0.82 | 21.4 | **3.04** | 32.5 | **4.66** | 59.3 | **15.0** | **<0.001** |
| 25(OH)D (ng/mL) | 10.9 | **2.27** | 16.8 | **2.4** | 35.0 | **11.0** | **<0.001** | 22.8 | **12.7** | 22.9 | **13.0** | 22.7 | **13.6** | 0.96 |
| Abbreviations: BMI, body mass index; WC, waist circumference; FBS, fasting blood sugar; TG, triglyceride; LDL-c, low density lipoprotein- cholesterol; HDL-c, high density lipoprotein- cholesterol; DBP, diastolic blood pressure; SBP, systolic blood pressure; VO2max, maximal oxygen uptake; T, tertile; DASH, dietary approach to stop hypertension.\* Data are presented as n (%) for categorical variables and or mean ± standard deviation for continuous variables\*\* The one-way analysis of variance and the chi-square test( or Fisher’s Exact test) was used for comparison of continuous and categorical variables among tertiles of 25(OH)D (ng/ml) and 1.25(OH)D(ng/ml). respectively. P <0.05 was considered significant. |

**Supplementary Table 2**.Odd ratio and 95% CI for obesity and metabolic syndrome and its components in the tertiles of vitamin D according to the DASH score

|  |
| --- |
| 25(OH)D  |
|  | **T1 (n=56)** | **T2 (n=61)** | **P value** | **T3 (n=46)** | **P value** | **P for trend** |  |
| DASH< 24 |  |  |  |  |  |  |  |
| Obesity  |
| Crude  | 1.0 | 3.12 (0.94-10.34) | 0.06 | 1.96 (0.51-7.43) | 0.32 | 0.32 |  |
| Model I | 1.0 | 2.08 (0.57-7.52) | 0.26 | 1.30 (0.31-5.42) | 0.71 | 0.76 |  |
| Model II | 1.0 | 2.72 (0.65-11.28) | 0.16 | 1.48 (0.30-7.25) | 0.62 | 0.70 |  |
| Model III | 1.0 | 4.69 (0.86-25.57) | 0.07 | 2.66 (0.41-17.06) | 0.30 | 0.39 |  |
| Metabolic syndrome |
| Crude  | 1.0 | 1.20 (0.39-3.73) | 0.74 | 1.23 (0.36-4.11) | 0.73 | 0.73 |  |
| Model I | 1.0 | 0.76 (0.22-2.58) | 0.66 | 1.06 (0.28-3.92) | 0.92 | 0.93 |  |
| Model II | 1.0 | 0.78 (0.22-2.73) | 0.70 | 1.13 (0.30-4.26) | 0.85 | 0.87 |  |
| Model III | 1.0 | 0.96 (0.25-3.66) | 0.96 | 1.37 (0.34-5.46) | 0.65 | 0.65 |  |
| High waist circumference |
| Crude  | 1.0 | 2.44 (0.80-7.47) | 0.11 | 1.53 (0.43-5.41) | 0.50 | 0.48 |  |
| Model I | 1.0 | 1.86 (0.58-5.91) | 0.29 | 1.36 (0.36-5.00) | 0.64 | 0.64 |  |
| Model II | 1.0 | 2.04 (0.57-7.32) | 0.27 | 1.26 (0.29-5.44) | 0.75 | 0.76 |  |
| Model III | 1.0 | 3.84 (0.86-17.13) | 0.07 | 1.95 (0.36-10.54) | 0.43 | 0.47 |  |
| High FBS |
| Crude  | 1.0 | 1.16 (0.53-2.50) | 0.70 | 0.92 (0.39-2.16) | 0.863 | 0.89 |  |
| Model I | 1.0 | 0.81 (0.35-1.83) | 0.64 | 0.82 (0.33-2.05) | 0.68 | 0.67 |  |
| Model II | 1.0 | 0.83 (0.34-1.99) | 0.68 | 0.91 (0.35-2.31) | 0.84 | 0.83 |  |
| Model III | 1.0 | 0.78 (0.32-1.92) | 0.60  | 0.86 (0.33-2.25) | 0.76 | 0.76 |  |
| High serum TG concentration |
| Crude  | 1.0 | 1.16 (0.53-2.50) | 0.46 | 1.58 (0.63-4.00) | 0.32 | 0.32 |  |
| Model I | 1.0 | 0.97 (0.37-2.49) | 0.94 | 1.47 (0.54-3.97) | 0.44 | 0.45 |  |
| Model II | 1.0 | 1.00 (0.37-2.67) | 0.99 | 1.58 (0.56-4.43) | 0.38 | 0.38 |  |
| Model III | 1.0 | 0.91 (0.33-2.50) | 0.85 | 1.32 (0.46-3.81) | 0.60 | 0.59 |  |
| Low serum HDL concentration |
| Crude  | 1.0 | 0.88 (0.42-1.87) | 0.75 | 0.77 (0.34-1.72) | 0.52 | 0.52 |  |
| Model I | 1.0 | 0.90 (0.42-1.93) | 0.79 | 0.76 (0.34-1.72) | 0.52 | 0.52 |  |
| Model II | 1.0 | 0.82 (0.37-1.81) | 0.63 | 0.80 (0.34-1.87) | 0.61 | 0.60 |  |
| Model III | 1.0 | 0.88 (0.38-2.00) | 0.76 | 0.84 (0.34-2.04) | 0.70 | 0.69 |  |
| Hypertension |
| Crude  | 1.0 | 5.89 (0.68-50.57) | 0.10 | 00-00 | 0.99 | 0.78 |  |
| Model I | 1.0 | 4.15 (0.46-27.56) | 0.20 | 00-00 | 0.99 | 0.67 |  |
| Model II | 1.0 | 3.75 (0.40-34.62) | 0.24 | 00-00 | 0.99 | 0.70 |  |
| Model III | 1.0 | 3.15 (0.29-33.56) | 0.34 | 00-00 | 0.99 | 0.59 |  |
| DASH> 24 | **T1 (n=30)** | **T2 (n=30)** | **P value** | **T3 (n=44)** | **P value** | **P for trend** |  |
| Obesity  |
| Crude  | 1.0 | 1.33 (0.27-6.58) | 0.72 | 2.45 (0.611-9.83) | 0.20 | 0.17 |  |
| Model I | 1.0 | 1.29 (0.25-6.49) | 0.75 | 1.85 (0.25-6.49) | 0.40 | 0.38 |  |
| Model II | 1.0 | 1.78 (0.28-11.15) | 0.53 | 2.34 (0.43-12.67) | 0.32 | 0.32 |  |
| Model III | 1.0 | 2.07 (0.29-14.52) | 0.46 | 2.51 (0.41-15.36) | 0.31 | 0.33 |  |
| Metabolic syndrome |
| Crude  | 1.0 | 0.69 (0.14-3.41) | 0.65 | 1.54 (0.42-5.58) | 0.50 | 0.42 |  |
| Model I | 1.0 | 0.62 (0.11-3.29) | 0.57 | 1.67 (0.40-6.98) | 0.47 | 0.41 |  |
| Model II | 1.0 | 0.44 (0.02-9.62) | 0.60 | 0.75 (0.02-22.0) | 0.86 | 0.69 |  |
| Model III | 1.0 | 0.33 (0.04-2.47) | 0.28 | 0.86 (0.15-4.97) | 0.87 | 0.95 |  |
| High waist circumference |
| Crude  | 1.0 | 0.73 (0.17-3.08) | 0.67 | 1.53 (0.46-5.00) | 0.47 | 0.39 |  |
| Model I | 1.0 | 0.68 (0.16-2.96) | 0.67 | 1.75 (0.48-6.27) | 0.39 | 0.33 |  |
| Model II | 1.0 | 0.64 (0.13-3.20) | 0.59 | 1.72 (0.43-6.93) | 0.44 | 0.35 |  |
| Model III | 1.0 | 0.54 (0.09-3.08) | 0.49 | 1.40 (0.29-6.63) | 0.67 | 0.51 |  |
| High FBS |
| Crude  | 1.0 | 0.42 (0.13-1.37) | 0.13 | 1.11 (0.42-2.88) | 0.82 | 0.65 |  |
| Model I | 1.0 | 0.38 (0.11-1.23) | 0.10 | 1.21 (0.42-3.45) | 0.71 | 0.62 |  |
| Model II | 1.0 | 0.33 (0.09-1.20) | 0.09 | 1.37 (0.45-4.17) | 0.57 | 0.39 |  |
| Model III | 1.0 | 0.30 (0.08-1.16) | 0.08 | 1.42 (0.43-2.62) | 0.55 | 0.42 |  |
| High serum TG concentration |
| Crude  | 1.0 | 1.35 (0.422-4.31) | 0.61 | 0.47 (0.14-1.59) | 0.22 | 0.19 |  |
| Model I | 1.0 | 1.30 (0.39-4.24) | 0.63 | 0.39 (0.10-1.45) | 0.63 | 0.15 |  |
| Model II | 1.0 | 1.03 (0.30-3.540 | 0.95 | 0.36 (0.09-1.36) | 0.13 | 0.12 |  |
| Model III | 1.0 | 0.94 (0.26-3.38) | 0.92 | 0.28 (0.06-1.17) | 0.08 | 0.08 |  |
| Low serum HDL concentration |
| Crude  | 1.0 | 0.88 (0.28-2.76) | 0.83 | 1.200 (0.41-3.48) | 0.73 | 0.70 |  |
| Model I | 1.0 | 0.86 (0.271-2.73) | 0.79 | 1.49 (0.47-4.70) | 0.48 | 0.46 |  |
| Model II | 1.0 | 0.81 (0.24-2.75) | 0.74 | 1.37 (0.41-4.51) | 0.60 | 0.56 |  |
| Model III | 1.0 | 0.86 (0.25-2.95) | 0.81 | 1.49 (0.43-5.11) | 0.52 | 0.49 |  |
| Hypertension |
| Crude  | 1.0 | 3.11 (0.30-31.90) | 0.33 | 2.70 (0.28-25.49) | 0.38 | 0.44 |  |
| Model I | 1.0 | 2.95 (0.27-31.32) | 0.36 | 1.77 (0.17-18.50) | 0.63 | 0.46 |  |
| Model II | 1.0 | 2.16 (0.19-23.99) | 0.52 | 1.56 (0.14-16.40) | 0.711 | 0.82 |  |
| Model III | 1.0 | 2.81 (0.18-41.93) | 0.45 | 0.53 (0.3-8.91) | 0.65 | 0.53 |  |
| 1.25(OH)D |
|  | **T1 (n=57)** | **T2 (n=50)** | **P value** | **T3 (n=56)** | **P value** | **P for trend** |  |
| DASH< 24 |  |  |  |  |  |  |  |
| Obesity  |
| Crude  | 1.0 | **3.30 (1.07-10.1)** | **0.03** | 1 (0.27-3.66) | **1** | 1 |  |
| Model I | 1.0 | **5.03 (1.38-18.31)** | **0.01** | 1.17 (0.29-4.75) | 0.82 | 0.70 |  |
| Model II | 1.0 | **4.46 (1.12-17.78)** | **0.03** | 1.05 (0.25-4.35) | 0.94 | 0.93 |  |
| Model III | 1.0 | **3.60 (1.01-14.68)** | **0.05** | 0.79 (0.17-3.64) | 0.76 | 0.78 |  |
| Metabolic syndrome |
| Crude  | 1.0 | 1.38 (0.43-4.45) | 0.51 | 1.21 (0.38-3.87) | 0.74 | 0.74 |  |
| Model I | 1.0 | 1.34 (0.38-4.69) | 0.64 | 1.43 (0.42-4.90) | 0.56 | 0.56 |  |
| Model II | 1.0 | 1.05 (0.27-4.01) | 0.94 | 1.45 (0.42-5.01) | 0.55 | 0.55 |  |
| Model III | 1.0 | 1.31 (0.36-4.79) | 0.68 | 3.64 (1.07-12.41) | 0.03 | 0.65 |  |
| High waist circumference |
| Crude  | 1.0 | 2.61 (0.82-8.27) | 0.10 | 1.70 (0.52-5.55) | 0.380 | 0.41 |  |
| Model I | 1.0 | 2.74 (0.82-9.13) | 0.09 | 1.93 (0.56-6.57) | 0.29 | 0.31 |  |
| Model II | 1.0 | 3.12 (0.81-11.9) | 0.09 | 1.57 (0.43-4.67) | 0.48 | 0.54 |  |
| Model III | 1.0 | 2.60 (0.63-10.56) | 0.18 | 1.33 (0.31-5.20) | 0.69 | 0.75 |  |
| High FBS |
| Crude  | 1.0 | 1.33 (0.50-2.52) | 0.76 | 0.84 (0.38-1.87) | 0.68 | 0.68 |  |
| Model I | 1.0 | 1.10 (0.46-2.62) | 0.81 | 0.88 (0.38-2.08) | 0.78 | 0.78 |  |
| Model II | 1.0 | 1.11 (0.45-2.72) | 0.80 | 0.84 (0.35-2.00) | 0.70 | 0.70 |  |
| Model III | 1.0 | 1.08 (0.45-2.75) | 0.87 | 0.91 (0.37-2.21) | 0.91 | 0.83 |  |
| High serum TG concentration |
| Crude  | 1.0 | 1.32 (0.56-3.11) | 0.52 | 0.75 (0.30-1.83) | 0.52 | 0.54 |  |
| Model I | 1.0 | 1.34 (0.53-3.38( | 0.53 | 0.79 (0.30-2.04) | 0.63 | 0.64 |  |
| Model II | 1.0 | 1.066 (0.40-2.81) | 0.89 | 0.75 (0.28-1.93) | 0.56 | 0.55 |  |
| Model III | 1.0 | 1.04 (0.36-2.89) | 0.94 | 0.72 (0.27-1.95) | 0.52 | 0.52 |  |
| Low serum HDL concentration  |
| Crude  | 1.0 | 1.05 (0.48-2.26) | 0.89 | 2.32 (1.06-5.08) | **0.03** | **0.03** |  |
| Model I | 1.0 | 1.05 (0.49-2.28) | 0.88 | 2.32 (1.06-5.07) | **0.03** | **0.03** |  |
| Model II | 1.0 | 1.03 (0.46-2.31) | 0.93 | 2.32 (1.05-5.13) | **0.03** | **0.03** |  |
| Model III | 1.0 | 1.02 (0.41-2.39) | 0.99 | 2.13 (1.01-4.98) | **0.05** | **0.05** |  |
| Hypertension |
| Crude  | 1.0 | 0.75 (0.12-4.69) | 0.76 | 0.64 (0.10-4.14) | 0.64 | 0.64 |  |
| Model I | 1.0 | 0.62 (0.09-4.20) | 0.62 | 0.77 (0.11-5.15) | 0.78 | 0.76 |  |
| Model II | 1.0 | 0.42 (0.05-3.66) | 0.43 | 0.86 (0.12-6.08) | 0.88 | 0.79 |  |
| Model III | 1.0 | 0.53 (0.051-5.55) | 0.59 | 0.78 (0.10-6.09) | 0.81 | 0.76 |  |
| DASH> 24 | **T1 (n=33)** | **T2 (n=40)** | **P value** | **T3 (n=34)** | **P value** | **P for trend** |  |
| Obesity |
| Crude  | 1.0 | 2.25 (0.62-8.16) | 0.21 | 1 (0.22-4.40) | 1 | 1 |  |
| Model I | 1.0 | 2.36 (0.63-8.76) | 0.19 | 1.15 (0.25-5.21) | 0.85 | 0.82 |  |
| Model II | 1.0 | 1.94 (0.49-7.36) | 0.33 | 1.14 (0.24-5.41) | 0.86 | 0.85 |  |
| Model III | 1.0 | 2.26 (0.51-9.87) | 0.27 | 1.41 (0.26-7.49) | 0.68 | 0.68 |  |
| Metabolic syndrome |
| Crude  | 1.0 | 1.35 (0.34-5.30) | 0.66 | 1.61 (0.40-6.37) | 0.49 | 0.49 |  |
| Model I | 1.0 | 1.65 (0.37-7.10) | 0.49 | 1.83 (0.41-7.99) | 0.42 | 0.42 |  |
| Model II | 1.0 | 1.35 (0.54-6.77) | 0.56 | 1.61 (0.35-7.26) | 0.53 | 0.53 |  |
| Model III | 1.0 | 3.02 (0.53-17.28) | 0.21 | 2.61 (0.42-15.13) | 0.28 | 0.29 |  |
| High waist circumference |
| Crude  | 1.0 | 1.73 (0.52-5.84) | 0.37 | 1.24 (0.33-4.58) | 0.74 | 0.75 |  |
| Model I | 1.0 | 1.84 (0.52-6.42) | 0.74 | 1.25 (0.32-4.81) | 0.74 | 0.75 |  |
| Model II | 1.0 | 1.51 (0.40-5.58) | 0.53 | 1.10 (0.27-4.44) | 0.88 | 0.88 |  |
| Model III | 1.0 | 2.19 (0.51-9.43) | 0.28 | 1.33 (0.20-6.05) | 0.70 | 0.74 |  |
| High FBS |
| Crude  | 1.0 | 1.03 (0.38-2.79) | 0.94 | 1.68 (0.63-4.68) | 0.31 | 0.30 |  |
| Model I | 1.0 | 1.05 (0.38-2.91) | 0.91 | 1.74 (0.61-4.96) | 0.29 | 0.29 |  |
| Model II | 1.0 | 1.25 (0.42-3.67) | 0.68 | 1.84 (0.61-5.25) | 0.27 | 0.27 |  |
| Model III | 1.0 | 0.96 (0.30-3.08) | 0.95 | 1.50 (0.46-4.81) | 0.49 | 0.47 |  |
| High serum TG concentration |
| Crude  | 1.0 | 1.49 (0.43-5.11) | 0.53 | 2.11 (0.62-7.20) | 0.23 | 0.22 |  |
| Model I | 1.0 | 1.54 (0.44-5.39) | 0.49 | 2.20 (0.62-7.74) | 0.21 | 0.21 |  |
| Model II | 1.0 | 1.73 (0.48-6.24) | 0.39 | 1.99 (0.55-7.14) | 0.28 | 0.29 |  |
| Model III | 1.0 | 3.00 (0.72-12.53) | 0.13 | 3.30 (0.79-13.77) | 0.10 | 0.10 |  |
| Low serum HDL concentration  |
| Crude  | 1.0 | 0.51(0.17-1.51) | 0.22 | 0.84 (0.26-2.67) | 0.76 | 0.87 |  |
| Model I | 1.0 | 0.50 (0.16-1.49) | 0.21 | 0.77 (0.23-2.52) | 0.67 | 0.67 |  |
| Model II | 1.0 | 0.44 (0.14-1.35) | 0.15 | 0.74 (0.21-2.51) | 0.63 | 0.61 |  |
| Model III | 1.0 | 0.44 (0.13-1.43) | 0.17 | 0.72 (0.20-2.55) | 0.61 | 0.64 |  |
| Hypertension |
| Crude  | 1.0 | 0.85 (0.16-4.55) | 0.85 | 0.65 (0.10-4.07) | 0.64 | 0.64 |  |
| Model I | 1.0 | 0.91 (0.16-5.08) | 0.91 | 0.74 (0.11-5.00) | 0.76 | 0.76 |  |
| Model II | 1.0 | 0.97 (0.16-5.80) | 0.97 | 0.54 (0.07-3.82) | 0.54 | 0.55 |  |
| Model III | 1.0 | 1.40 (0.17-11.09) | 0.74 | 0.33 (0.30-3.70) | 0.36 | 0.42 |  |
| Abbreviations: FBS, fasting blood sugar; TG, triglyceride; LDL, low density lipoprotein; HDL, high density lipoprotein; T, tertile; n, number of subjects; DASH, dietary approach to stop hypertension.P-trend is obtained by logistic regression analysis.Model I: adjusted for the effect of sex and age.Model II: adjusted for the effect of sex, age, and smoking.Model III: adjusted for the effect of sex, age, smoking, physical activity, occupation, and education. P <0.05 was considered significant.  |

**Supplementary Table 3.** The combined effect of serum vitamin D and cardiorespiratory fitness with obesity and metabolic syndrome (Odds ratio and 95%CI) according to the DASH score

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| 25(OH)D |
|  | Low D/Low CRF (n=40) | Low D/ High CRF (n=43) | P | High D/ Low CRF (n=41) | P | High D/ High CRF (n=36) | P | P for trend\* |
| DASH< 24 |  |  |  |  |  |  |  |  |
| Obesity |
| Crude | 1.0 | 0.11 (0.01-0.98) | **0.04** | 1.02 (0.70-5.82) | 0.19 | **00-00** | 0.98 | 0.37 |
| Model 1 | 1.0 | 0.05 (0.06-0.58) | **0.01** | 1.20 (0.36-4.01) | 0.76 | **00-00** | 0.99 | 0.18 |
| Model 2 | 1.0 | 0.09 (0.08-1.00) | **0.05** | 2.88 (0.63-13.07) | 0.16 | **00-00** | 0.99 | 0.61 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.75 (0.18-3.04) | 0.69 | 1.23 (0.34-4.43) | 0.76 | 1.12 (0.29-4.27) | 0.85 | 0.69 |
| Model 1 | 1.0 | 0.48 (0.10-2.35) | 0.37 | 0.70 (0.17-2.84) | 0.62 | 0.74 (0.17-2.84) | 0.62 | 0.88 |
| Model 2 | 1.0 | 0.47 (0.09-2.46) | 0.37 | 099 (0.21-4.46) | 0.99 | 0.66 (0.12-3.63) | 0.63 | 0.93 |
| DASH> 24 | Low D/Low CRF (n=19) | Low D/ High CRF (n=28) | P | High D/ Low CRF (n=30) | P | High D/ High CRF (n=26) | P | P for trend\* |
| Obesity |
| Crude | 1.0 | 1.04 (0.15-6.97) | 0.96 | 3.42 (0.64-18.11) | 0.14 | **0.66 (0.08-5.22)** | 0.70 | 0.84 |
| Model 1 | 1.0 | 0.76 (0.09-6.23) | 0.80 | 3.46 (0.60-19.85) | 0.16 | **0.43 (0.05-4.47)** | 0.53 | 0.89 |
| Model 2 | 1.0 | 0.95 (0.07-12.74) | 0.97 | 4.05 (0.54-30.2) | 0.17 | **0.44 (0.03-6.08)** | 0.54 | 0.95 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.41 (0.06-2.79) | 0.36 | 1.52 (0.33-6.82) | 0.58 | 0.90 (0.17-4.66) | 0.90 | 0.64 |
| Model 1 | 1.0 | 0.09 (0.00-0.87) | **0.03** | 2.42 (0.32-17.9) | 0.38 | 0.20 (0.02-1.58) | 0.13 | 0.97 |
| Model 2 | 1.0 | 0.13 (0.07-2.50) | 0.17 | 1.90 (0.18-19-70) | 0.58 | 0.15 (0.01-2.28) | 0.17 | 0.64 |
| 1,25(OH)D |
|  | Low D/Low CRF (n=39) | Low D/ High CRF (n=40) | P | High D/ Low CRF (n=42) | P | High D/ High CRF (n=30) | P | P-trend |
| DASH< 24 |  |  |  |  |  |  |  |  |
| Obesity  |
| Crude | 1.0 | **0.09 (0.01-0.83)** | **0.03** | 1.33 (0.47-3.76) | 0.59 | **00-00** | 0.99 | 0.11 |
| Model 1 | 1.0 | **0.05 (0.06-0.57)** | **0.01** | 1.14 (0.35-3.68) | 0.82 | **00-00** | 0.99 | 0.09 |
| Model 2 | 1.0 | **0.05 (0.04-0.58)** | **0.01** | 0.70 (0.18-2.47) | 0.61 | **00-00** | **0.99** | 0.06 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.75 (0.18-3.05) | 0.69 | 1.10 (0.30-3.94) | 0.88 | 1.00 (0.26-3.78) | 1.0 | 0.86 |
| Model 1 | 1.0 | 0.60 (0.13-2.83) | 0.52 | 0.86 (0.21-3.44) | 0.84 | 0.77 (0.17-3.34) | 0.73 | 0.88 |
| Model 2 | 1.0 | 0.40 (0.07-2.18) | 0.29 | 0.62 (0.14-2.73) | 0.53 | 0.45 (0.08-2.53) | 0.36 | 0.53 |
| DASH> 24 | Low D/Low CRF (n=24) | Low D/ High CRF (n=31) | P | High D/ Low CRF (n=27) | P | High D/ High CRF (n=24) | P | P-trend |
| Obesity  |
| Crude | 1.0 | 0.50 (0.10-2.50) | 0.39 | 1.65 (0.41-6.63) | 0.47 | 0.45 (0.07-2.75) | 0.33 | 0.86 |
| Model 1 | 1.0 | 0.46 (0.06-3.17) | 0.43 | 1.78 (0.43-7.33) | 0.43 | 0.43 (0.05-3.71) | 0.45 | 0.79 |
| Model 2 | 1.0 | 0.84 (0.07-10.09) | 0.89 | 5.95 (0.79-44.45) | 0.08 | 0.54 (0.03-8.59) | 0.66 | 0.42 |
| Metabolic syndrome |
| Crude | 1.0 | 0.69 (0.15-3.13) | 0.63 | 1.35 (0.32-5.56) | 0.67 | 0.45 (0.07-2.78) | 0.38 | 0.66 |
| Model 1 | 1.0 | 0.15 (0.02-1.22) | 0.07 | 1.56 (0.27-8.84) | 0.61 | 0.10 (0.01-1.04) | 0.055 | 0.58 |
| Model 2 | 1.0 | 0.17 (0.01-2.52) | 0.20 | 2.47 (0.30-20.27) | 0.39 | 0.17 (0.01-3.15) | 0.24 | 0.82 |
| \* Obtained by logistic regression analyses. Model 1 adjusted for age and sex. Model 2 additionally adjusted for physical activity, smoking, occupation, and education. |

**Supplementary Table 4.** The combined effect of serum vitamin D and cardiorespiratory fitness with obesity and metabolic syndrome (Odds ratio and 95%CI) according to age groups

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| 25(OH)D |
|  | Low D/Low CRF (n=35) | Low D/ High CRF (n=45) | P | High D/ Low CRF (n=20) | P | High D/ High CRF (n=39) | P | P for trend\* |
| Age< 33 |  |  |  |  |  |  |  |  |
| Obesity |
| Crude | 1.0 | 0.25 (0.02-2.55) | 0.24 | 3.55 (0.74-16.87) | 0.11 | 00-00 | 0.99 | 0.52 |
| Model 1 | 1.0 | 0.20 (0.01-2.41) | 0.20 | 4.09 (0.80-20.86) | 0.09 | 00-00 | 0.99 | 0.70 |
| Model 2 | 1.0 | 0.33 (0.02-5.08) | 0.44 | **8.52 (1.02-70.93)** | **0.04** | 00-00 | 0.99 | 0.78 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.39 (0.03-4.52) | 0.45 | 1.83 (0.23-14.13) | 0.56 | 3.00 (0.56-15.96) | 0.19 | 0.06 |
| Model 1 | 1.0 | 0.21 (0.01-3.01) | 0.25 | 2.76 (0.28-27.14) | 0.38 | 1.65 (0.22-12.13) | 0.61 | 0.13 |
| Model 2 | 1.0 | 0.29 (0.01-5.87) | 0.42 | 6.37 (0.35-21.25) | 0.21 | 3.26 (0.21-14.54) | 0.39 | 0.08 |
| Age> 33 | Low D/Low CRF (n=27) | Low D/ High CRF (n=26) | P | High D/ Low CRF (n=51) | P | High D/ High CRF (n=23) | P | P for trend\* |
| Obesity |
| Crude | 1.0 | 0.33 (0.07-1.47) | 0.14 | 1.14 (0.03-3.30) | 0.80 | 0.23 (0.04-1.26) | 0.09 | 0.45 |
| Model 1 | 1.0 | **0.19 (0.03-0.96)** | **0.04** | **0.12 (0.02-0.07)** | **0.02** | 1.04 (0.96-1.06) | 0.58 | 0.32 |
| Model 2 | 1.0 | 0.39 (0.06-2.48) | 0.32 | 1.67 (0.43-6.45) | 0.45 | 0.23 (0.02-1.86) | 0.16 | 0.85 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.63 (0.17-2.39) | 0.50 | 0.68 (0.22-2.06) | 0.52 | 0.36 (0.08-1.63) | 0.18 | 0.23 |
| Model 1 | 1.0 | 0.32 (0.07-1.44) | 0.14 | 0.60 (0.18-2.01) | 0.41 | **0.16 (0.03-0.87)** | **0.03** | 0.09 |
| Model 2 | 1.0 | 0.46 (0.08-2.47) | 0.37 | 0.62 (0.16-2.36) | 0.48 | 0.18 (0.02-1.16) | 0.07 | 0.12 |
| 1,25(OH)D |
|  | Low D/Low CRF(n=24) | Low D/ High CRF (n=41) | P | High D/ Low CRF (n=31) | P | High D/ High CRF (n=43) | P | P-trend |
| Age< 33 |  |  |  |  |  |  |  |  |
| Obesity  |
| Crude | 1.0 | 0.12 (0.01-1.22) | **0.07** | **0.74 (0.16-3.32)** | 0.69 | **00-00** | 0.99 | 0.07 |
| Model 1 | 1.0 | **0.08 (0.00-1.00)** | **0.05** | 0.59 (0.12-2.83) | 0.51 | **00-00**  | 0.99 | 0.06 |
| Model 2 | 1.0 | 0.14 (0.01-1.84) | **0.13** | 0.65 (0.10-4.05) | 0.64 | **00-00** | **0.99** | 0.08 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.89 (0.13-5.76) | 0.90 | 0.75 (0.09-5.81) | 0.79 | 1.15 (0.19-6.84) | 0.87 | 0.84 |
| Model 1 | 1.0 | 0.34 (0.03-3.20) | 0.34 | 0.49 (0.05-4.85) | 0.54 | 0.38 (0.04-3.31) | 0.38 | 0.63 |
| Model 2 | 1.0 | 0.19 (0.01-3.14) | 0.25  | 0.28 (0.02-3.55) | 0.32 | 0.19 (0.01-2.71) | 0.22 | 0.42 |
| Age> 33 | Low D/Low CRF (n=38) | Low D/ High CRF (n=30) | P | High D/ Low CRF (n=40) | P | High D/ High CRF (n=19) | P | P for trend\* |
| Obesity  |
| Crude | 1.0 | **0.40 (0.09-1.68)** | 0.21 | 2.28 (0.82-6.33) | 0.11 | 0.41 (0.07-2.17) | 0.29 | 0.71 |
| Model 1 | 1.0 | **0.23 (0.04-1.07)** | 0.06 | 2.35 (0.81-6.83) | 0.11 | **0.22 (0.03-1.30)** | 0.09 | 0.79 |
| Model 2 | 1.0 | 0.44 (0.07-2.53) | 0.36  | 2.74 (0.80-9.32) | 0.10 | **0.30 (0.03-2.46)** | 0.26 | 0.49 |
| Metabolic syndrome  |
| Crude | 1.0 | 0.86 (0.24-3.06) | 0.82 | 1.68 (0.57-4.98) | 0.34 | 0.82 (0.18-3.67) | 0.80 | 0.70 |
| Model 1 | 1.0 | 0.45 (0.11-1.85) | 0.27 | 1.64 (0.51-.22) | 0.39 | 0.38 (0.07-1.95) | 0.25 | 0.94 |
| Model 2 | 1.0 | 0.55 (0.11-2.71) | 0.46 | 1.40 (0.40-4.86) | 0.59 | 0.43 (0.06-2.86) | 0.38 | 0.99 |
| \* Obtained by logistic regression analyses. Model 1 adjusted for sex. Model 2 additionally adjusted for physical activity, smoking, occupation, and education. |