

# Fat-to-Muscle Ratio Is Independently Associated with Hyperuricemia and a Reduced Estimated Glomerular Filtration Rate in Chinese Adults: The China National Health Survey

Supplementary materials

Table S1. The cross-over prevalence of hyperuricemia and reduced eGFR in FMR groups, stratified by sex

| Age-groups | Male      |            |                    |            | Female    |            |                    |            |
|------------|-----------|------------|--------------------|------------|-----------|------------|--------------------|------------|
|            | HUA cases | Prevalence | Reduced eGFR cases | Prevalence | HUA cases | Prevalence | Reduced eGFR cases | Prevalence |
| 20–        | 371       | 28.89      | 164                | 12.77      | 156       | 7.79       | 132                | 6.59       |
| 30–        | 596       | 29.83      | 438                | 21.92      | 197       | 6.46       | 418                | 13.71      |
| 40–        | 798       | 25.21      | 1001               | 31.62      | 375       | 7.52       | 1300               | 26.07      |
| 50–        | 706       | 22.59      | 1161               | 37.15      | 646       | 13.94      | 1727               | 37.28      |
| 60–        | 446       | 20.73      | 1050               | 48.81      | 553       | 18.56      | 1524               | 51.16      |
| 70–80      | 170       | 21.28      | 508                | 63.58      | 229       | 22.95      | 670                | 67.13      |
| Overall    | 3087      | 24.65      | 4322               | 34.51      | 2156      | 11.56      | 5771               | 30.95      |

HUA: hyperuricemia; eGFR: estimated glomerular filtration rate, mL/min per 1.73 m<sup>2</sup>.

Table S2. The independent effect of FMR on hyperuricemia in the study population.

|             | Men     |        |       |         |        |       | Women   |        |        |         |        |        |       |       |        |        |
|-------------|---------|--------|-------|---------|--------|-------|---------|--------|--------|---------|--------|--------|-------|-------|--------|--------|
|             | Model 1 |        |       | Model 2 |        |       | Model 1 |        |        | Model 2 |        |        |       |       |        |        |
| Overall     | OR      | 95% CI | P     | OR      | 95% CI | P     | OR      | 95% CI | P      | OR      | 95% CI | P      |       |       |        |        |
| FMR         |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| Q2          | 1.686   | 1.384  | 2.055 | <0.001  | 1.604  | 1.317 | 1.953   | <0.001 | 1.920  | 1.572   | 2.346  | <0.001 | 1.914 | 1.564 | 2.342  | <0.001 |
| Q3          | 2.639   | 2.217  | 3.141 | <0.001  | 2.312  | 1.907 | 2.803   | <0.001 | 2.819  | 2.373   | 3.350  | <0.001 | 2.671 | 2.124 | 3.360  | <0.001 |
| Q4          | 3.693   | 3.147  | 4.334 | <0.001  | 2.713  | 2.145 | 3.433   | <0.001 | 5.621  | 4.685   | 6.744  | <0.001 | 4.473 | 3.396 | 5.892  | <0.001 |
| Age < 40    |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| FMR         |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| Q2          | 1.876   | 1.415  | 2.488 | <0.001  | 1.754  | 1.300 | 2.366   | <0.001 | 2.219  | 1.445   | 3.408  | <0.001 | 2.195 | 1.439 | 3.350  | <0.001 |
| Q3          | 3.369   | 2.601  | 4.365 | <0.001  | 2.842  | 1.965 | 4.110   | <0.001 | 3.087  | 2.294   | 4.156  | <0.001 | 2.463 | 1.557 | 3.897  | <0.001 |
| Q4          | 4.304   | 3.186  | 5.813 | <0.001  | 2.580  | 1.549 | 4.299   | <0.001 | 11.031 | 8.022   | 15.168 | <0.001 | 6.271 | 3.354 | 11.726 | <0.001 |
| 40≤ Age <60 |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| FMR         |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| Q2          | 1.761   | 1.357  | 2.286 | <0.001  | 1.617  | 1.230 | 2.127   | 0.001  | 2.013  | 1.492   | 2.715  | <0.001 | 2.016 | 1.493 | 2.721  | <0.001 |
| Q3          | 2.737   | 2.084  | 3.594 | <0.001  | 2.261  | 1.693 | 3.020   | <0.001 | 3.221  | 2.389   | 4.342  | <0.001 | 3.075 | 2.166 | 4.364  | <0.001 |
| Q4          | 3.696   | 2.974  | 4.593 | <0.001  | 2.676  | 1.992 | 3.595   | <0.001 | 5.243  | 3.930   | 6.994  | <0.001 | 4.285 | 2.864 | 6.412  | <0.001 |
| Age ≥60     |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| FMR         |         |        |       |         |        |       |         |        |        |         |        |        |       |       |        |        |
| Q2          | 1.478   | 0.931  | 2.347 | 0.0952  | 1.486  | 0.940 | 2.348   | 0.088  | 1.979  | 1.289   | 3.037  | 0.003  | 1.984 | 1.293 | 3.044  | <0.001 |
| Q3          | 1.985   | 1.425  | 2.764 | 0.0002  | 2.019  | 1.286 | 3.171   | 0.003  | 2.472  | 1.692   | 3.611  | <0.001 | 2.411 | 1.551 | 3.747  | 0.003  |
| Q4          | 3.281   | 2.214  | 4.861 | <.0001  | 3.002  | 1.773 | 5.082   | <0.001 | 5.281  | 3.425   | 8.142  | <0.001 | 4.549 | 2.623 | 7.889  | <0.001 |

Model 1 was adjusted for age, rural/urban places, educational level, study sites, alcohol drinking status (male only), smoking status (male only), hypertension, diabetes, dyslipidemia, and serum creatine. Model 2 was additionally adjusted for body mass index based on Model 1. FMR: fat-to-muscle ratio; Q2–Q4: the numbers fall in the 25–49<sup>th</sup>, 50–74<sup>th</sup> and 75–100<sup>th</sup> range of FMR. OR: odds ratio; CI: confidence interval.

Table S3. The independent effect of FMR on reduced estimated glomerular filtration rate in the male study population aged 20–59.

| Overall               | Model 1 |        |       |                  | Model 2 |        |       |                  | Model 3 |        |       |              |
|-----------------------|---------|--------|-------|------------------|---------|--------|-------|------------------|---------|--------|-------|--------------|
|                       | OR      | 95% CI | P     |                  | OR      | 95% CI | P     |                  | OR      | 95% CI | P     |              |
| <b>FMR</b>            |         |        |       |                  |         |        |       |                  |         |        |       |              |
| Q2                    | 1.326   | 1.147  | 1.532 | <0.001           | 1.328   | 1.082  | 1.631 | 0.008            | 1.261   | 1.029  | 1.546 | 0.027        |
| Q3                    | 1.350   | 1.167  | 1.563 | <0.001           | 1.334   | 1.042  | 1.708 | 0.023            | 1.188   | 0.931  | 1.515 | 0.161        |
| Q4                    | 1.429   | 1.230  | 1.661 | <0.001           | 1.410   | 1.038  | 1.916 | 0.029            | 1.224   | 0.917  | 1.632 | 0.165        |
| <b>Age &lt;40</b>     |         |        |       |                  |         |        |       |                  |         |        |       |              |
| <b>FMR</b>            |         |        |       |                  |         |        |       |                  |         |        |       |              |
| Q2                    | 0.980   | 0.759  | 1.265 | 0.877            | 0.941   | 0.663  | 1.334 | 0.726            | 0.840   | 0.594  | 1.187 | 0.314        |
| Q3                    | 1.096   | 0.834  | 1.439 | 0.511            | 0.991   | 0.664  | 1.480 | 0.966            | 0.795   | 0.537  | 1.177 | 0.244        |
| Q4                    | 0.974   | 0.732  | 1.297 | 0.857            | 0.898   | 0.499  | 1.619 | 0.715            | 0.702   | 0.410  | 1.202 | 0.191        |
| <b>40≤ Age &lt;60</b> |         |        |       |                  |         |        |       |                  |         |        |       |              |
| <b>FMR</b>            |         |        |       |                  |         |        |       |                  |         |        |       |              |
| Q2                    | 1.549   | 1.297  | 1.849 | <b>&lt;0.001</b> | 1.549   | 1.236  | 1.942 | <b>&lt;0.001</b> | 1.483   | 1.179  | 1.866 | <b>0.001</b> |
| Q3                    | 1.528   | 1.281  | 1.822 | <b>&lt;0.001</b> | 1.528   | 1.152  | 2.027 | <b>0.004</b>     | 1.380   | 1.045  | 1.821 | <b>0.024</b> |
| Q4                    | 1.704   | 1.421  | 2.042 | <b>&lt;0.001</b> | 1.669   | 1.177  | 2.369 | <b>0.005</b>     | 1.454   | 1.037  | 2.040 | <b>0.031</b> |

Model 1 was adjusted for age, rural/urban places, educational level, alcohol drinking status, smoking status, hypertension, diabetes, and dyslipidemia. Model 2 was additionally adjusted for body mass index based on Model 1. Model 3 was additionally adjusted for hyperuricemia based on Model 2. FMR: fat-to-muscle ratio; Q2–Q4: the values fall in the 25–49<sup>th</sup>, 50–74<sup>th</sup> and 75–100<sup>th</sup> centile of FMR. OR: odds ratio; CI: confidence interval.

Table S4. The independent effect of FMR on reduced estimated glomerular filtration rate in the female study population aged 20–59.

| Overall     | Model 1 |        |       |       | Model 2 |        |       | Model 3 |        |       |       |       |
|-------------|---------|--------|-------|-------|---------|--------|-------|---------|--------|-------|-------|-------|
|             | OR      | 95% CI | P     |       | OR      | 95% CI | P     | OR      | 95% CI | P     |       |       |
| FMR         |         |        |       |       |         |        |       |         |        |       |       |       |
| Q2          | 1.067   | 0.962  | 1.183 | 0.215 | 1.058   | 0.958  | 1.168 | 0.259   | 1.023  | 0.930 | 1.126 | 0.633 |
| Q3          | 1.162   | 1.052  | 1.284 | 0.004 | 1.152   | 1.049  | 1.264 | 0.004   | 1.067  | 0.930 | 1.224 | 0.348 |
| Q4          | 0.954   | 0.837  | 1.088 | 0.474 | 0.947   | 0.832  | 1.077 | 0.395   | 0.818  | 0.663 | 1.008 | 0.059 |
| Age <40     |         |        |       |       |         |        |       |         |        |       |       |       |
| FMR         |         |        |       |       |         |        |       |         |        |       |       |       |
| Q2          | 1.019   | 0.821  | 1.265 | 0.862 | 1.018   | 0.818  | 1.267 | 0.871   | 0.966  | 0.793 | 1.177 | 0.725 |
| Q3          | 1.162   | 0.880  | 1.534 | 0.282 | 1.143   | 0.736  | 1.774 | 0.542   | 1.077  | 0.701 | 1.654 | 0.728 |
| Q4          | 1.006   | 0.696  | 1.455 | 0.972 | 1.139   | 0.599  | 2.167 | 0.685   | 0.944  | 0.507 | 1.759 | 0.787 |
| 40≤ Age <60 |         |        |       |       |         |        |       |         |        |       |       |       |
| FMR         |         |        |       |       |         |        |       |         |        |       |       |       |
| Q2          | 1.056   | 0.941  | 1.185 | 0.342 | 1.057   | 0.941  | 1.186 | 0.342   | 1.026  | 0.917 | 1.148 | 0.650 |
| Q3          | 1.137   | 1.023  | 1.264 | 0.019 | 1.127   | 0.957  | 1.328 | 0.148   | 1.062  | 0.900 | 1.252 | 0.468 |
| Q4          | 0.932   | 0.808  | 1.077 | 0.332 | 0.885   | 0.705  | 1.109 | 0.280   | 0.798  | 0.634 | 1.005 | 0.055 |

Model 1 was adjusted for age, rural/urban places, educational level, hypertension, diabetes, and dyslipidemia. Model 2 was additionally adjusted for body mass index based on Model 1. Model 3 was additionally adjusted for hyperuricemia based on Model 2. FMR: fat-to-muscle ratio; Q2–Q4: the values fall in the 25–49<sup>th</sup>, 50–74<sup>th</sup> and 75–100<sup>th</sup> centile of FMR. OR: odds ratio; CI: confidence interval.

Table S5. The association between hyperuricemia and reduced estimated glomerular filtration rate in the study population.

|                               | Male  |        |       |        | Female |        |       |        |
|-------------------------------|-------|--------|-------|--------|--------|--------|-------|--------|
|                               | OR    | 95% CI |       | P      | OR     | 95% CI |       | P      |
| Overall                       | 2.834 | 2.544  | 3.158 | <0.001 | 2.957  | 2.590  | 3.376 | <0.001 |
| <b>FMR stratified</b>         |       |        |       |        |        |        |       |        |
| Q1                            | 3.568 | 2.708  | 4.701 | <0.001 | 3.726  | 2.545  | 5.457 | <0.001 |
| Q2                            | 2.803 | 2.286  | 3.436 | <0.001 | 2.923  | 2.037  | 4.195 | <0.001 |
| Q3                            | 2.947 | 2.429  | 3.575 | <0.001 | 2.962  | 2.180  | 4.024 | <0.001 |
| Q4                            | 2.679 | 2.252  | 3.187 | <0.001 | 2.855  | 2.473  | 3.295 | <0.001 |
| <b>Age-stratified</b>         |       |        |       |        |        |        |       |        |
| 20–                           | 2.472 | 1.963  | 3.113 | <0.001 | 2.935  | 2.081  | 4.138 | <0.001 |
| 40–                           | 2.656 | 2.355  | 2.995 | <0.001 | 3.020  | 2.634  | 3.462 | <0.001 |
| 60–80                         | 4.503 | 3.578  | 5.666 | <0.001 | 3.040  | 2.457  | 3.760 | <0.001 |
| <b>Urban-rural stratified</b> |       |        |       |        |        |        |       |        |
| Urban                         | 2.681 | 2.338  | 3.074 | <0.001 | 2.883  | 2.440  | 3.408 | <0.001 |
| Rural                         | 3.294 | 2.641  | 4.108 | <0.001 | 3.141  | 2.532  | 3.895 | <0.001 |

The covariates adjusted for were age, body mass index, urban/rural place, education, smoking status (males only), alcohol drinking status, hypertension, dyslipidemia, and diabetes. OR: odds ratio; CI: confidence interval. FMR: fat-to-muscle ratio; Q1–Q4: the values fall in the 0–24<sup>th</sup>, 25–49<sup>th</sup>, 50–74<sup>th</sup> and 75–100<sup>th</sup> centile of FMR.