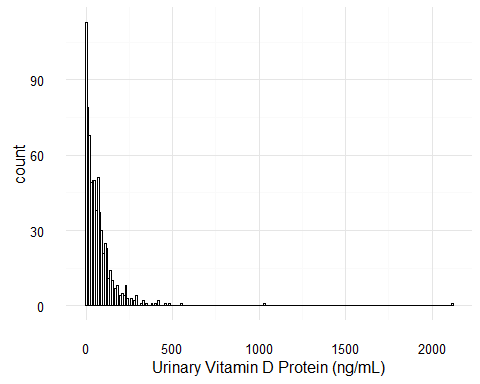
URINARY VITAMIN D BINDING PROTEIN UPDATES FROM CONFERENCE CALL

WINDY WANG

May 17, 2016



*FIGURE 1. Distribution of urinary vitamin D binding protein after excluding two hemolysed samples (n=739).*

As observed from *Figure 1*, there still appear to be two subjects with very high urinary vitamin D binding protein (UDBP) concentrations (>1000 ng/mL), even though their samples were not marked as hemolysed. There were only two subjects with hemolysed samples for baseline measures; the UDBP concentration values were 2867 ng/mL and 128 ng/mL. Unfortunately, it appears that hemolysed samples are not fully able to explain the right skew at baseline. However, taking a look at the samples from the 3 year and 6 year visits, it appears that all samples marked as hemolysed tended to have extremely high UDBP concentrations, as expected. The only anomaly to that pattern was subject 2124 at baseline, with a value of 128 ng/mL as noted above.

TABLE 1. Subject characteristics according to UDBP concentration categories after exclusion of hemolysed samples. Samples with values below the lower detection limit of the assay was further subcategorized.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Undetectable (n=12) | Low UDBP (n=57) | Normal UDBP (n=360) | High UDBP (n=310) |
| Age (years) | | 48.7 (11.4) | 47.8 (9.2) | 50.4 (10.1) | 49.6 (10.0) |
| Ethnicity (%)\* | European | 6 (50%) | 32 (56.1%) | 238 (66.1%) | 205 (66.1%) |
| Latino/a | 6 (50%) | 10 (17.5%) | 55 (15.3%) | 42 (13.5%) |
| Other | - | 10 (17.5%) | 35 (9.7%) | 43 (13.9%) |
| South Asian | - | 5 (8.8%) | 32 (8.9%) | 20 (6.5%) |
| Sex (%)\* | Female | 7 (58.3%) | 32 (56.1%) | 262 (72.8%) | 202 (65.2%) |
| Male | 5 (41.7%) | 25 (43.9%) | 98 (27.2%) | 108 (34.8%) |
| BMI (kg/m2)\*\*\* | | 32.9 (10.2) | 33.0 (7.0)a | 30.0 (6.2)ab | 32.0 (5.8)b |
| Waist circumference(cm)\*\*\* | | 97.5 (22.9) | 105.4 (17.5)a | 96.1 (15.3)ab | 101.2 (14.1)b |
| Estimated GFR (mL/min/1.73m2) | | 98.9 (13.2) | 106.2 (12.5) | 105.0 (14.6) | 104.4 (14.6) |
| Microalbumin:Creatinine\*\* | | 0.7 (0.4) | 0.6 (0.4)a | 1.1 (2.7)ab | 1.8 (7.1)b |
| Urinary creatinine (mmol/L)\*\*\* | | 12.1 (3.3) | 13.5 (5.6) | 8.8 (5.2)a | 14.9 (6.2)a |
| Urinary albumin (mg/L)\*\*\* | | 8.2 (5.2) | 6.7 (5.1) | 6.1 (10.6) | 21.2 (99.9) |
| Serum creatinine (μmol/L) | | 76.5 (14.5) | 71.2 (11.3) | 69.3 (13.4) | 70.6 (13.7) |
| Serum 25(OH)D (nmol/L)\* | | 51.0 (20.7) | 48.3 (20.3)a | 57.9 (23.7)a | 54.3 (22.5) |
| Diastolic blood pressure (mmHg)\*\* | | 77.1 (10.1) | 80.7 (9.7) | 78.7 (9.5)a | 81.7 (11.1)a |
| Mean arterial pressure (mmHg)\*\* | | 92.0 (10.7) | 95.7 (10.5) | 94.0 (10.9)a | 97.2 (11.9)a |
| Systolic blood pressure (mmHg)\* | | 121.7 (13.2) | 125.7 (13.9) | 124.6 (16.2)a | 128.1 (16.0)a |
| Parathyroid Hormone (pmol/L)\*\*\* | | 4.7 (1.8) | 4.7 (1.8) | 4.2 (1.5)a | 4.9 (1.8)a |
| Serum ALT (U/L)\* | | 38.3 (13.5) | 36.5 (25.4)a | 32.5 (14.3)a | 33.7 (18.4) |
| Blood glucose (mmol/L) | Fasting | 5.0 (0.5) | 5.4 (1.1) | 5.1 (0.9) | 5.1 (0.9) |
| 2h OGTT | 5.4 (1.6) | 7.2 (3.9) | 6.4 (2.5) | 6.7 (3.2) |
| Diabetic Status\* | Diabetes | - | 13 (22.8%) | 32 (8.9%) | 45 (14.5%) |
| Normal | 11 (91.7%) | 43 (75.4%) | 309 (85.8%) | 248 (80%) |
| Prediabetes | 1 (8.3%) | 1 (1.8%) | 19 (5.3%) | 17 (5.5%) |

Continuous values are reported as mean (standard deviation) and discrete variables are reported as n (proportion). Significance for continuous variables were tested using Kruskal-Wallis with Bonferroni’s t-test for pairwise comparisons. Significance for discrete variables were examined using chi-squared test of independence. Hemolysed samples were removed from analysis. \*p < 0.05, \*\*p < 0.01, \*\*p < 0.001

I also separated the samples marked as “<” (undetectable; n=12) and those with a reading below the lower detection limit (low UDBP; n=57). The number of subjects are slightly different in *Table 1* compared to *Table 2* (subject characterization prior separating subjects with low UDBP into "undetectable" and "low" for comparison purposes) due to the exclusion of hemolysed samples. I used the Kruskal-Wallis Test to assess if there were significant differences between the UDBP groups. Pairwise comparisons were conducted using Bonferroni's t-test.

I added in alanine transaminase to assess liver function in this cohort, as a paper by Doorenbos et al. (2012) suggested that vitamin D binding protein (VDBP) loss may be compensated by increased VDBP production in the liver.

*TABLE 2. Subject characteristics according to UDBP concentration categories after exclusion of hemolysed samples. Samples with values below the lower detection limit of the assay was not further subcategorized.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Low UDBP (n=69) | Normal UDBP (n=360) | High UDBP (n=310) |
| Age (years) | | 47.9 (9.5) | 50.4 (10.1) | 49.6 (10.0) |
| Ethnicity (%) | European | 38 (55.1%) | 238 (66.1%) | 205 (66.1%) |
| Latino/a | 16 (23.2%) | 55 (15.3%) | 42 (13.5%) |
| Other | 10 (14.5%) | 35 (9.7%) | 43 (13.9%) |
| South Asian | 5 (7.2%) | 32 (8.9%) | 20 (6.5%) |
| Sex (%)\* | Female | 39 (56.5%) | 262 (72.8%) | 202 (65.2%) |
| Male | 30 (43.5%) | 98 (27.2%) | 108 (34.8%) |
| BMI (kg/m2)\*\*\* | | 33.0 (7.5)a | 30.0 (6.2)ab | 32.0 (5.8)b |
| Waist circumference(cm)\*\*\* | | 104.0 (18.6)a | 96.1 (15.3)ab | 101.2 (14.1)b |
| Estimated GFR (mL/min/1.73m2) | | 104.9 (12.8) | 105.0 (14.6) | 104.4 (14.6) |
| Microalbumin:Creatinine\*\* | | 0.6 (0.4) | 1.1 (2.7) | 1.8 (7.1) |
| Urinary creatinine (mmol/L)\*\*\* | | 13.2 (5.2)a | 8.8 (5.2)ab | 14.9 (6.2)b |
| Urinary albumin (mg/L)\*\*\* | | 7.0 (5.1) | 6.1 (10.6)a | 21.2 (99.9)a |
| Serum creatinine (μmol/L) | | 72.1 (12.0) | 69.3 (13.4) | 70.6 (13.7) |
| Serum 25(OH)D (nmol/L)\* | | 48.7 (20.2)a | 57.9 (23.7)a | 54.3 (22.5) |
| Diastolic blood pressure (mmHg)\*\* | | 80.1 (9.8) | 78.7 (9.5)a | 81.7 (11.1)a |
| Mean arterial pressure (mmHg)\*\* | | 95.0 (10.5) | 94.0 (10.9)a | 97.2 (11.9)a |
| Systolic blood pressure (mmHg)\* | | 125.0 (13.8) | 124.6 (16.2)a | 128.1 (16.0)a |
| Parathyroid Hormone (pmol/L)\*\*\* | | 4.7 (1.8) | 4.2 (1.5)a | 4.9 (1.8)a |
| Serum ALT (U/L)\* | | 36.8 (23.8)a | 29.8 (14.1)a | 33.3 (18.6) |
| Blood glucose (mmol/L) | Fasting | 5.4 (1.0) | 5.1 (0.9) | 5.1 (0.9) |
| 2h OGTT | 6.8 (3.6) | 6.4 (2.5) | 6.7 (3.2) |
| Diabetic Status | Diabetes | 13 (18.8%) | 32 (8.9%) | 45 (14.5%) |
| Normal | 54 (78.3%) | 309 (85.8%) | 248 (80%) |
| Prediabetes | 2 (2.9%) | 19 (5.3%) | 17 (5.5%) |

Continuous values are reported as mean (standard deviation) and discrete variables are reported as n (proportion). Significance for continuous variables were tested using Kruskal-Wallis with Bonferroni’s t-test for pairwise comparisons. Significance for discrete variables were examined using chi-squared test of independence. Hemolysed samples were removed from analysis. \*p < 0.05, \*\*p < 0.01, \*\*p < 0.001