# Prevalence of Asymptomatic Hyperuricemia and its Association with Prediabetes, Dyslipidemia and Subclinical Inflammation Markers among Young Healthy Adults in Qatar

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## Introduction

**Background**: Asymptomatic hyperuricemia is a highly prevalent condition globally, affecting 10-20% of the global population. However, its prevalence is not known in Qatar. Although no guidelines currently treat asymptomatic hyperuricemia, multiple studies have demonstrated its association with incidence chronic inflammatory diseases. There not enough studies on the association of asymptomatic hyperuricemia and subclinical metabolic disturbances.

**Purpose:** The aim of this work is to:

- Investigate the prevalence of asymptomatic hyperuricemia in Qatar
- Examine its association with changes in markers of hematological indices, dyslipidemia, prediabetes, and subclinical inflammation.

## Method

1. Cross-sectional study of young adult participants, aged 18-40 years old and devoid of comorbidities (N=871).
2. Data collected from Qatar BioBank.
3. Hyperuricemia defined as of uric acid levels > 6.0 mg/dL.
4. Outcome variables were categorized into 4 groups:
   - Hematological indices (Hgb, RBC, Folate, TIBC, WBC, Monocyte %)
   - Lipid Panel (Triglycerides, HDL, LDL)
   - Glycemic markers (c-peptide, glucose, HBA1C)
   - Subclinical markers (ferritin, MHR)
5. T-tests and Mann-Whitney U tests were used.
6. Correlation tests (Pearson's (r) and Spearman's rank correlation coefficient (ρ)) were used.
7. Confounders were identified, age groups, sex, BMI, smoking and exercise.
8. Multiple linear regression models controlling for confounders were used to predict the difference of means for each outcome variable between hyperuricemic and normouricemic groups:
   - Model 1 adjusted for age and sex.
   - Model 2 adjusted for age, sex, BMI, exercise, and smoking.

## Results

1. The prevalence of asymptomatic hyperuricemia in our Qatari cohort was 21.2% (95% CI [18.6%, 24.1%]).
2. Statistically significant results in all outcomes (except WBC) when using t-tests (or Mann-Whitney U tests) and correlation tests.
3. After controlling for confounders, all results for hematological indices lost statistical significance.
4. The association between HbA1c and hyperuricemia retained statistical significance in Model 1 but lost its significance in Model 2.
5. After adjusting for confounders, HDL-c, c-peptide and MHR were associated with hyperuricemia most significantly.

| Variable (N=871) | N (%) or Mean (SD) or Median (IQR) |
|---|---|
| Male<br>Female | 397 (46%)<br>474 (54%) |
| Age | 29.43 (5.98) |
| Serum Uric Acid (μmol/L) | 293.2 (80.9) |
| BMI (Kg/m$^2$) | 27.85 (6.24) |
| Waist-to-Hip ratio | 1.03 (0.27) |
| Hemoglobin (g/dL) | 13.48 (1.9) |
| Red blood cells (10$^6$/μL) | 4.96 (0.58) |
| Folate (nmol/L) | 20.45 (7.02) |
| TIBC (μmol/L) | 61.5 (9.82) |
| White blood cells (10$^3$/μL) | 6.79 (1.94) |
| Monocyte percentage (%) | 7.37 (1.87) |
| *Triglyceride (mmol/L) | 0.96 (6.1, 8.5) |
| HDL-c (mmol/L) | 1.41 (0.38) |
| LDL-c (mmol/L) | 2.81 (0.75) |
| *C-peptide (ng/mL) | 1.87 (1.37, 2.73) |
| Glucose (mmol/L) | 5 (0.73) |
| $HbA_{1c}$ (%) | 5.23 (0.42) |
| *Ferritin (μg/L) | 35 (11,92) |
| *MHR | 5.23 (4.02, 6.84) |

**Table 1.** Summary of Baseline Characteristics of the Sample

| Parameter | Normouricemic Mean (SD) | Hyperuricemic Mean (SD) | p-value |
|---|---|---|---|
| Hemoglobin (g/dL) | 13.17 (1.88) | 14.60 (1.56) | <0.001 |
| Folate (nmol/L) | 20.83 (7.07) | 19.05 (6.66) | 0.002 |
| RBC (10$^6$/μL) | 4.87 (0.57) | 5.29 (0.51) | <0.001 |
| TIBC (μmol/L) | 62.44 (10.08) | 58.03 (7.89) | <0.001 |
| WBC (10$^3$/μL) | 6.76 (2.00) | 6.91 (1.72) | 0.348 |
| Monocyte (%) | 7.27 (1.84) | 7.74 (1.97) | 0.002 |
| HDL (mmol/L) | 1.47 (0.37) | 1.19 (0.29) | <0.001 |
| LDL (mmol/L) | 2.75 (0.73) | 3.07 (0.79) | <0.001 |
| *Triglycerides (mmol/L) | 0.90 (0.63, 1.30) | 1.2 (0.81, 1.60) | <0.001 |
| *C-peptide (ng/mL) | 1.77 (1.31, 2.55) | 2.38 (1.72, 3.49) | <0.001 |
| Glucose (mmol/L) | 4.94 (0.74) | 5.21 (0.63) | <0.001 |
| $HbA_{1c}$ (%) | 5.21 (0.39) | 5.32 (0.50) | 0.002 |
| *Ferritin (μg/L) | 25 (9, 67) | 94 (53, 146.5) | <0.001 |
| *MHR | 4.94 (3.82, 6.46) | 6.60 (5.18, 8.08) | <0.001 |

**Table 2.** Comparison of Normouricemic and Hyperuricemic Groups

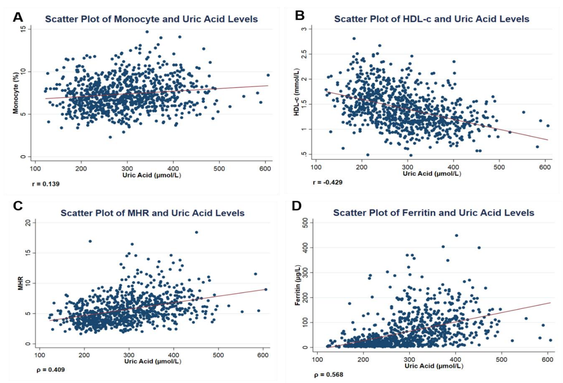


**Figure 1.** Scatter plots depicting uric acid association with subclinical inflammation markers. A: monocyte %; B: HDL-c; C: MHR; D: Ferritin.

| | $^{\$}$Model 1 | | | | $^{\$}$Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Coefficient | 95% CI | p-value | $R^2$ | Coefficient | 95% CI | p-value | $R^2$ |
| Hemoglobin (g/dL) | -0.12 | (-0.35, 0.11) | 0.315 | 0.56 | -0.14 | (-0.39, 0.10) | 0.259 | 0.57 |
| Folate (nmol/L) | -0.55 | (-1.81, 0.70) | 0.389 | 0.03 | -0.37 | (-1.67, 0.93) | 0.576 | 0.04 |
| RBC (10$^6$/μL) | 0.04 | (-0.04, 0.12) | 0.362 | 0.37 | -0.01 | (-0.10, 0.08) | 0.785 | 0.35 |
| TIBC (μmol/L) | 0.07 | (-1.54, 1.68) | 0.934 | 0.18 | 0.00 | (-1.72, 1.72) | 0.999 | 0.19 |
| WBC (10$^3$/μL) | 0.16 | (-0.20, 0.51) | 0.386 | 0.00 | -0.12 | (-0.50, 0.26) | 0.534 | 0.04 |
| Monocytes (%) | -0.01 | (-0.34, 0.32) | 0.960 | 0.06 | 0.19 | (-0.17, 0.54) | 0.298 | 0.06 |
| HDL (mmol/L) | -0.14 | (-0.20, -0.08) | <0.001 | 0.21 | -0.07 | (-0.14, -0.01) | 0.019 | 0.26 |
| LDL (mmol/L) | 0.18 | (0.05, 0.31) | 0.008 | 0.11 | 0.13 | (-0.01, 0.27) | 0.065 | 0.11 |
| Triglycerides (mmol/L) | 0.20 | (0.09, 0.31) | 0.001 | 0.13 | 0.12 | (-0.01, 0.25) | 0.066 | 0.15 |
| C-peptide (ng/mL) | 0.75 | (0.46, 1.04) | <0.001 | 0.05 | 0.38 | (0.06, 0.69) | 0.018 | 0.12 |
| Glucose (mmol/L) | 0.15 | (0.02, 0.28) | 0.021 | 0.05 | 0.06 | (-0.08, 0.21) | 0.395 | 0.07 |
| $HbA_{1c}$ (%) | 0.10 | (0.02, 0.17) | 0.011 | 0.04 | 0.04 | (-0.04, 0.12) | 0.358 | 0.07 |
| *Ferritin (Males) (μg/L) | 16.01 | (1.93, 30.09) | 0.026 | 0.04 | 8.08 | (-7.18, 23.34) | 0.298 | 0.07 |
| *Ferritin (Females) (μg/L) | 15.06 | (0.19, 29.93) | 0.047 | 0.01 | 13.72 | (-0.27, 27.7) | 0.054 | 0.00 |
| MHR | 0.62 | (0.25, 1.00) | 0.001 | 0.21 | 0.47 | (0.06, 0.89) | 0.026 | 0.21 |

**Table 4.** Multiple Linear Regression Models# Predicting the Difference of Means for Each Variable of Interest between Hyperuricemic and Normouricemic Groups

## Conclusion

1. The prevalence of asymptomatic hyperuricemia in young adult Qatari population was found to be 21.2%.
2. Asymptomatic hyperuricemia is associated with markers of dyslipidemia, prediabetes, and subclinical inflammation.
3. Our study would advocate for subjects with asymptomatic hyperuricemia, to be informed about the potential risk of progression to chronic diseases, and to be recommended suitable lifestyle modifications to prevent the incidence of such disorders.

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## Acknowledgements

The authors thank Qatar Biobank for providing the cohort data for this study. The authors thank Dr. Suhail Doi, Dr. George Hindi and Dr. Tawanda Chivese at the Department of Population Medicine, College of Medicine, Qatar University for their help with the statistical analysis.