**Supplemental Online Content**

**Educational attainment is associated with Mortality as well as Kidney and Cardiovascular Outcomes in the German Chronic Kidney Disease (GCKD) Cohort**

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**Supplementary Methods.**

**Supplementary Figure S1.** Flow chart of participants included in the analysis.

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This supplemental material has been provided by the authors to give readers additional information about their work.

**­­Supplemental Methods.**

**Baseline variables**

All participants were physically examined by the study team. All clinical measurements were performed according to predefined standard operating procedures. Data collection procedures were monitored by an internal quality control panel that was advised by external reviewers. A sub-sample of patient interviews was recorded and audited for quality control. Case report forms were managed using Askimed (https://www.askimed.com), a cloud-based web platform. The data was exported in September 2020.

BMI was calculated as weight in kilograms divided by the height in meters squared. Blood pressure was calculated as the mean value of three consecutive measurements of each participant. Hypertension was defined as either SBP ≥ 140 mmHg or DBP ≥ 90 mmHg or use of antihypertensive medication. Diabetes mellitus was defined as HbA1c ≥ 6,5% or use of antidiabetic medication. (Former) smoker was defined as currently smoking or having smoked in the past. Income refers to the annual gross income and the following response categories were given: 1) < 25.000 €, 2) ≥ 25.000 € < 50.000 €; 3) ≥ 50.000 € < 100.000 €, 4) ≥ 100.000 € and 5) unknown/no response. Physical activity was defined as more than 30 minutes of training/day. Prevalent CVD is defined by previous coronary, cerebrovascular, or peripheral vascular disease.

Dietary information was assessed using a self-administered food frequency questionnaire (FFQ) of the European Prospective Investigation into Cancer and Nutrition (EPIC) Potsdam study, provided by the Human Study Center of the German Institute of Human Nutrition Potsdam-Rehbrücke. As described in [1, 2], 3283 out of 4754 approached participants (69.1%) who attended the GCKD follow-up study visit in year 2 (2012-2014) returned the FFQs. Out of those who returned the FFQ, 3129 participants provided information regarding their educational attainment, had answered questions completely (i.e. no more than 25 missing FFQ items) and had plausible energy intake. The data was used to assess observance of healthy dietary patterns by the calculation of the Dietary Approaches to Stop Hypertension (DASH) diet, Mediterranean diet and CKD diet scores [1, 2]. The DASH diet is characterized by high intake of fruits, grains, vegetables and low-fat dairy, and low intake of meat, fats, and sweets. The Mediterranean diet is characterized by high intake of fruits, cereals, vegetables, fish, legumes, and unsaturated fats, and low intake of meat, dairy, and alcohol. The CKD diet follows CKD-specific dietary recommendations and is low in intake of sodium, protein, sugar and cholesterol, and high in potassium and fiber [2]. Higher scores correspond to a closer observance of these dietary patterns.

Biomaterials including serum, plasma and urine were collected in a standardized fashion and transported frozen to a central biobank following standard operating procedures for future analyses.12 Serum creatinine was analyzed using an IDMS traceable methodology (Creatinine plus, Roche). Kidney function was expressed as eGFR by the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula and urinary albumin/creatinine ratio (UACR). The new serum biomarkers known to be associated with cardiovascular and kidney disease were quantified by the use of the following methods: neutrophil gelatinase-associated lipocalin, NGAL (ELISA - BioVendor), osteopontin, OPN (ELISA - R&D Systems), N-terminal pro-B-type natriuretic peptide, NT-proBNP (Roche Cobras411), high-sensitive troponin T, hs-TropT (Roche Cobras411), heart-type fatty acid binding protein, H-FABP (ELISA - HycultBiotech), bone-specific alkaline phosphatase, BAP (IDS-iSYS) and intact plasma parathyroid hormone, iPTH (IDS-iSYS).

### **Statistical analysis**

MGMs are undirected probabilistic graphical models, where each node corresponds to one variable, which can be either discrete or continuous, and one edge between two nodes represents a conditional dependency between them given all other variables in the graphical model. Thus, a variable is only connected with educational attainment if its association or interaction cannot be explained by other investigated variables in the model.

**Supplemental Figure 1. Flow chart of participants included in the analysis.**

N = 5217 GCKD Study Inclusion Criteria

age: 18 – 74 years­

eGFR: 30-60 ml/min/1.73m2 or

eGFR > 60 ml/min/1.73m2 in presence of albuminuria/proteinuria

(albuminuria > 300mg/g creatinine or albuminuria > 300mg/day or proteinuria > 500mg/g creatinine or proteinuria > 500mg/day)

N = 122 patients were excluded due to missing information about their educational attainment

N = 5095:

* Analysis to identify the association between educational attainment and CKD etiology at baseline.
* Analysis to identify the association between educational attainment and baseline variables (2010-2012) by Mixed Graphical Model (MGM) (N = 4369 instead of 5095 due to missing of at least one data point)
* Prospective analysis to assess association between educational attainment and all-cause mortality, major adverse cardiovascular events and kidney failure.
* Mediation analysis.

4754 participants who attended follow-up study visit in year 2 (2012-2014) received food frequency questionnaire (FFQ)

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3283 participants returned FFQ

N = 154 patients were excluded due to ≥ 26 FFQ missing items, implausible energy intake, or lack of information about the educational attainment.

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- Dietary intake stratified by educational attainment (N = 3129)

- Analysis to assess the association between educational attainment and healthy dietary patterns by Mixed Graphical Model (N = 2147 instead of 3129 due to missing of at least on data point)

**Supplemental Figure 2. Design of the current study.**



*Abbreviations: MACE, major adverse cardiovascular events MGM, mixed graphical models*

**Supplemental Figure 3. Variables independently associated with low or medium educational attainment compared to high educational attainment identified by the Mixed Graphical Model (MGM) algorithm based on the follow-up visit in year 2 in the German Chronic Kidney Disease (GCKD) cohort.**

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**A, B:** Data included DASH diet score. **C, D:** Data included Mediterranean diet score. **E,**

**F:** Data included CKD diet score. Positive and negative associations are shown as blue and red edges, respectively. The strength of the association, i.e., the weight of the corresponding coefficient, is encoded by the edge width. The strengths of associations in low vs. high educational attainment were for DASH diet score: -0.109 (A); for Mediterranean diet score: -0.102 (C); for CKD diet score: -0.087 (E).

**Supplemental Table 1: Baseline characteristics of German Chronic Kidney Disease (GCKD) participants with dietary information and all GCKD participants.**

|  |  |  |
| --- | --- | --- |
| Baseline Characteristics | *n* = 3129  with dietary information | Total *n* = 5217  whole cohort |
| Age, years, mean ± SD | 60.0 ± 11.7 | 63.1 ± 12 |
| Female gender (%) | 41.4 | 40.0 |
| BMI, (kg/m2), median (IQR) | 28.6 (7.2) | 28.9 (7.5) |
| Smoking status (%)  (Former) smoker  Never smoker | 57.1  42.9 | 59.0  41.0 |
| Alcohol consumption (%)  ≥3x/week  <3x/week | 19.0  81.0 | 19.0  81.0 |
| Physical activity (%)  <3x /week  ≥3x/week  unknown | 39.7  59.3  1.0 | 41.5  57.2  1.3 |
| Systolic blood pressure, mmHg, mean ± SD | 139.1 ± 19.6 | 138.3 ± 21.1 |
| Diabetes mellitus (%) | 31.3 | 35.8 |
| eGFR, (ml/min/1.73m2), mean ± SD | 49.8 ± 17.8 | 47.7 ± 19.2 |
| UACR, (mg/g), median (IQR) | 46.4 (311) | 49.8 (315.1) |
| Anti-hypertensive medication (%) | 91.9 | 92.4 |
| Anti-diabetic medication (%) | 24.6 | 28.5 |
| Lipid-lowering medication (%) | 50.2 | 51.2 |
| Anti-gout medication (%) | 32.0 | 32.8 |

Abbreviations: BMI, body mass index; eGFR, estimated glomerular filtration rate (CKD-EPI equation); UACR, urine albumin-to-creatinine ratio;

**Supplemental Table 2. Generation of the CASMIN (Comparative Analysis of Social Mobility in Industrial Nations) variable in the German Chronic Kidney Disease (GCKD) cohort study.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CASMIN 1**  **CASMIN 2**  **CASMIN 3** | | **Highest school qualification** | | | |
| No school degree | Lowest school degree (“*Volks-*/*Hauptschule”*) | Intermediate secondary school (*“Mittlere Reife”*) | Highest school degree *(“Fach-/Abitur”*) |
| **Highest vocational qualification** | No training | **1** | **1** | **2** | **2** |
| In training |  | **1** | **2** | **2** |
| Other qualifications |  | **1** | **2** | **2** |
| Master apprenticeship  (*“Meister“*) |  | **1** | **2** | **2** |
| Basic vocational training (*“Lehre/Fachschule”*) |  | **1** | **2** | **2** |
| University *(“Fachhochschule/Universität”*) |  | **3** | **3** | **3** |

**Supplemental Table 3. Dietary intake by educational attainment in the German Chronic Kidney Disease (GCKD) cohort study (*n* = 3129).**

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristic  median (IQR) | low (50.6%) | medium  (32.6%) | high  (16.8%) |
| Energy Intake (kcal/day) | 2089.8 (1037.2) | 2137.2 (1049.2) | 2351.1 (1069.4) |
| DASH diet score | 31.4 ± 7.0 | 32.7 ± 7.2 | 32.8 ± 7.0 |
| Mediterranean diet score | 4.2 ± 1.6 | 4.4 ± 1.6 | 4.7 ± 1.5 |
| CKD diet score | 17.8 ± 3.6 | 18.2 ± 3.6 | 18.4 ± 3.5 |
| Salt intake (g/1000 kcal) | 2.4 (0.6) | 2.3 (0.6) | 2.3 (0.6) |
| Potassium intake (g/1000 kcal) | 1.3 (0.4) | 1.3 (0.3) | 1.3 (0.2) |
| Magnesium intake (g/1000 kcal) | 0.2 (0) | 0.2 (0) | 0.2 (0) |
| Dietary fiber (g/1000 kcal) | 9.1 (2.9) | 9.1 (2.9) | 9.1 (2.8) |
| Total protein (g/1000 kcal) | 34.8 (8) | 34.6 (7.7) | 34 (7.2) |
| Plant-based protein (g/1000 kcal) | 11.3 (2.7) | 11.6 (2.6) | 11.6 (2.9) |
| Fat (g/1000 kcal) | 45 (8.4) | 44.3 (8.2) | 43.3 (8.7) |
| Cholesterol (mg/1000 kcal) | 157.6 (45.6) | 155.6 (43.2) | 151 (47) |
| PUFA+MUFA/SFA | 1.4 (0.4) | 1.4 (0.3) | 1.4 (0.3) |
| Carbohydrates (g/1000 kcal) | 102.7 (23.1) | 104 (21.2) | 104.3 (24.5) |
| Sugar (g/1000 kcal) | 48.6 (23.3) | 50.4 (21.9) | 48.4 (22.4) |

Abbreviations: CKD, chronic kidney disease; DASH, Dietary Approaches to Stop Hypertension; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; SFA, saturated fatty acids.

*Note:* Dietary intakes are given per 1000 kcal to adjust for higher caloric intake in higher educated patients. Values are expressed as medians (interquartile range) or mean ± standard deviation.

**Supplemental Table 4: Distribution of diagnoses contributing to CKD across categories of educational attainment in the German Chronic Kidney Disease (GCKD) cohort study.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Educational attainment | | |
| CKD etiology | **All** | **low** | **medium** | **high** |
| Diabetic nephropathy | 1374 (27.0) | 882 (32.5) | 321 (20.2) | 171 (21.6) |
| Vascular nephropathy | 2116 (41.5) | 1228 (45.2) | 553 (34.9) | 335 (42.4) |
| Primary GN | 1157 (22.7) | 531 (19.5) | 418 (26.4) | 208 (26.3) |
| MPGN | 45 (0.9) | 19 (0.7) | 19 (1.2) | 7 (0.9) |
| Post-infectious GN | 27 (0.5) | 14 (0.5) | 9 (0.5) | 5 (0.6) |
| IgA nephropathy | 416 (8.2) | 167 (6.1) | 163 (10.3) | 86 (10.9) |
| ­FSGS | 221 (4.3) | 110 (4.0) | 83 (5.2) | 28 (3.5) |
| ­Rapidly progressive pauci-immune GN | 48 (0.9) | 25 (0.9) | 16 (1.0) | 7 (0.9) |
| Minimal change GN | 70 (1.4) | 34 (1.3) | 29 (1.8) | 7 (0.9) |
| Rapidly progressive anti-GBM GN | 7 (0.1) | 5 (0.2) | 1 (0.1) | 1 (0.1) |
| Membranous GN | 161 (3.2) | 86 (3.2) | 43 (2.7) | 32 (4.0) |
| Other | 246 (4.8) | 122 (4.5) | 81 (5.1) | 43 (5.4) |
| Systemic disease | 594 (11.7) | 297 (10.9) | 215 (13.6) | 82 (10.4) |
| Granulomatosis with polyangiitis | 118 (2.3) | 47 (1.7) | 53 (3.3) | 18 (2.3) |
| Scleroderma | 5 (0.1) | 2 (0.1) | 1 (0.1) | 2 (0.3) |
| Microscopic polyangiitis | 74 (1.5) | 37 (1.4) | 24 (1.5) | 13 (1.6) |
| TTP | 8 (0.2) | 3 (0.1) | 2 (0.1) | 3 (0.4) |
| Amyloidosis | 11 (0.2) | 4 (0.1) | 6 (0.4) | 1 (0.1) |
| Lupus erythematosus | 139 (2.7) | 54 (2.0) | 64 (4.0) | 21 (2.7) |
| Sarcoidosis | 32 (0.6) | 16 (0.6) | 12 (0.8) | 4 (0.5) |
| Gout nephropathy | 115 (2.3) | 79 (2.9) | 21 (1.3) | 15 (1.9) |
| Other | 101 (2.0) | 60 (2.2) | 34 (2.1) | 7 (0.9) |
| Interstitial nephropathy | 441 (8.7) | 229 (8.4) | 152 (9.6) | 60 (7.6) |
| Analgesic nephropathy | 155 (3.0) | 95 (3.5) | 47 (3.0) | 13 (1.6) |
| Hereditary disease | 229 (4.5) | 96 (3.5) | 93 (5.9) | 40 (5.1) |
| ADPKD | 188 (3.7) | 79 (2.9) | 78 (4.9) | 31 (3.9) |
| Acute kidney injury | 237 (4.7) | 149 (5.5) | 60 (3.8) | 28 (3.5) |
| Single kidney | 323 (6.3) | 159 (5.8) | 113 (7.1) | 51 (6.4) |
| Obstructive nephropathy | 369 (7.2) | 188 (6.9) | 131 (8.3) | 50 (6.3) |
| Miscellaneous | 229 (4.5) | 124 (4.6) | 73 (4.6) | 32 (4.0) |
| Undetermined | 321 (6.3) | 175 (6.4) | 91 (5.7) | 55 (7.0) |

Values are expressed as number of participants and percentages. Percentages do not sum up to 100% because individuals could be assigned to more than a single cause of CKD by their treating nephrologist. *Abbreviations*: ADPKD, autosomal dominant polycystic kidney disease; anti-GBM, anti-glomerular basement membrane; FSGS, focal segmental glomerulosclerosis; GN, glomerulonephritis; MPGN, membranoproliferative glomerulonephritis; TTP, thrombotic thrombocytopenic purpura.

**Supplemental Table 5. Biopsies performed in patients with presumed leading cause of CKD in the German Chronic Kidney Disease (GCKD) cohort study.**

|  |  |  |
| --- | --- | --- |
| **CKD etiology** | **Biopsy performed** | **Biopsy not performed or unknown** |
| Diabetic nephropathy | 32 (4.2%) | 729 (95.8%) |
| Vascular nephropathy | 90 (7.6%) | 1085 (92.2%) |
| Primary glomerulonephritis | 769 (80.8%) | 183 (19.2%) |
| Systemic disease | 306 (75.0) | 102 (25.0%) |
| Interstitial nephropathy | 36 (16.4%) | 183 (83.6%) |
| Hereditary disease | 19 (9%) | 192 (91%) |
| Acute kidney injury | 6 (9.5%) | 57 (90.5%) |
| Single kidney | 8 (5.9%) | 127 (94.1%) |
| Obstructive nephropathy | 6 (5%) | 115 (95%) |
| Miscellaneous | 1 (2.3) | 43 (97.7%) |
| Undetermined | 63 (6.3%) | 941 (93.7%) |

Treating nephrologists were requested to identify the presumed cause of kidney disease on a case report form with tic boxes with pre-defined disease categories.

**Supplemental Table 6. Coefficients of the Mixed Graphical Model (MGM) estimated in the German Chronic Kidney Disease (GCKD) cohort study.**

|  |  |  |
| --- | --- | --- |
| Variable | low vs. high  educational attainment | medium vs. high  educational attainment |
| HDL | -0.04 | 0 |
| CRP | 0.002 | 0 |
| LDL | 0 | 0 |
| Triglyceride | -0.427 | 0 |
| Uric acid | 0.016 | -0.094 |
| Hemoglobulin | 0 | -0.002 |
| HbA1c | 0 | 0.005 |
| Albumin | 0 | 0 |
| Calcium | 0.061 | 0 |
| Phosphate | 0 | 0 |
| Cystatin C | 0.013 | 0 |
| Urea | 0.032 | -0.013 |
| Sodium | -0.03 | 0 |
| Age | 0.206 | -0.433 |
| eGFR | 0 | -0.005 |
| Systolic BP | 0.031 | 0 |
| BMI | 0.295 | 0.169 |
| Galectin | 0 | 0.056 |
| NGAL | 0.034 | 0 |
| BAP | 0.047 | 0 |
| PINP | 0 | 0.019 |
| iPTH | -0.038 | 0 |
| NT-proBNP | 0.066 | 0 |
| hs-TropT | -0.067 | 0 |
| Osteopontin | 0.062 | 0 |
| H-FABP | 0.047 | 0 |
| Copeptin | 0 | 0 |
| Male gendera | -0.306 | -0.67 |
| Female gendera | 0 | 0 |
| Diabetes mellitus | 0 | 0.014 |
| Non-smokingb | -0.374 | -0.232 |
| Smokingb | 0 | 0 |
| BP medication | 0.155 | 0 |
| CVDc | 0.456 | 0 |
| No CVDc | 0 | 0 |
| Alc. <3x/weekd | 0.599 | 0.074 |
| Alc. >3x/weekd | 0 | 0 |
| Private health insurancee | -3.138 | -1.665 |
| Public health insurancee | 0 | 0 |
| Income <25,000 €f | 1.636 | 0.633 |
| Income >25,000 €f | 0 | 0 |
| UACR | 0 | -0.01 |

*Abbreviations*: Alc, alcohol; BAP, bone-specific alkaline phosphatase; BP, blood pressure; BMI, body mass index; CRP, C-reactive protein; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate using based on CKD-EPI equation; HbA1c, glycated hemoglobin; HDL, high-density lipoprotein; H-FABP, heart-type fatty acid binding protein; hs-TropT, high-sensitive troponin T; iPTH, intact plasma parathyroid hormone; LDL, low-density lipoprotein; NGAL, neutrophil gelatinase-associated lipocalin; NT-proBNP, N-terminal pro-B-type natriuretic peptide; PINP, procollagen type I N propeptide; UACR, urine albumin-to-creatinine ratio. aIn the MGM approach, “female” was used as the reference category for which no coefficient is returned by the algorithm. bIn the MGM approach, “smoking” was used as the reference category for which no coefficient is returned by the algorithm. **c**In the MGM approach, “no CVD” was used as the reference category for which no coefficient is returned by the algorithm. **d**In the MGM approach, “Alc. > 3x/week” was used as the reference category for which no coefficient is returned by the algorithm. **e**In the MGM approach, “Public health insurance” was used as the reference category for which no coefficient is returned by the algorithm. **f**In the MGM approach, “Income >25,000 €” was used as the reference category for which no coefficient is returned by the algorithm.

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**Supplemental Table 7. Mediators of the association between low educational attainment and all-cause mortality, MACE and kidney failure in the German Chronic Kidney Disease (GCKD) cohort study.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | All-cause mortality | MACE | Kidney failure |
| Mediators | **Proportion mediated (95% CI)a** | **Proportion mediated (95% CI)a** | **Proportion mediated (95% CI)a** |
| BMI | 0.16 (0.00–0.70) | 0.04 (-0.36-0.56) | -0.04 (-0.67–0.53) |
| Smoking | **0.21 (0.07–1.13)** | 0.08 (-0.11-0.88) | 0.10 (-0.71–0.87) |
| Alcohol | 0.02 (-0.08–0.16) | 0.06 (-0.15-0.46) | -0.10 (-0.77–0.89) |
| CVD | **0.22 (0.09–0.85)** | **0.39 (0.12-2.26)** | 0.07 (-0.13–0.56) |
| Low income | 0.20 (-0.18–1.20) | 0.38 (-2.54-4.57) | 0.14 (-2.60–2.24) |
| Public health insurance | 0.05 (-0.35–0.57) | 0.05 (-0.64-0.69) | 0.04 (-0.84–0.77) |
| BP medic. | 0.03 (-0.02–0.14) | 0.05 (-0.20-0.35) | 0.00 (-0.18–0.17) |
| SBP | -0.03 (-0.16–0.00) | 0.04 (-0.05-0.40) | 0.01 (-0.05–0.14) |
| CRP | **0.11 (0.02–0.58)** | 0.03 (-0.08-0.22) | 0.05 (-0.12–0.53) |
| HDL | 0.03 (-0.05–0.23) | 0.07 (-0.09-0.48) | -0.02 (-0.22–0.19) |
| Triglyceride | -0.01 (-0.07–0.02) | 0.03 (0.02-0.19) | -0.01 (-0.13–0.04) |
| Uric acid | **0.04 (0.01–0.19)** | 0.00 (-0.01-0.09) | 0.00 (-0.12–0.12) |
| Calcium | -0.03 (-0.38–0.12) | 0.00 (-0.03-0.14) | 0.04 (-0.31–0.00) |
| Sodium | 0.01 (-0.03–0.09) | 0.00 (-0.01-0.05) | 0.00 (-0.09–0.07) |
| NGAL | **0.09 (0.02–0.43)** | -0.02 (-0.20-0.06) | 0.13 (-0.68–0.94) |
| BAP | **0.09 (0.03–0.49)** | 0.01 (-0.10-0.11) | 0.01 (-0.16–0.16) |
| iPTH | 0.01 (-0.09–0.15) | 0.00 (-0.00-0.03) | 0.01 (-0.14–0.19) |
| NT-proBNP | **0.18 (0.06–0.79)** | -0.02 (-0.29-0.14) | 0.12 (-0.66–1.17) |
| hs-TropT | 0.02 (-0.09–0.20) | 0.01 (-0.04-0.12) | 0.02 (-0.08–0.19) |
| OPN | **0.10 (0.01–0.47)** | 0.01 (-0.07-0.10) | 0.08 (-0.52–0.91) |
| H-FABP | **0.09 (0.02–0.30)** | 0.05 (-0.04-0.37) | 0.07 (-0.09–0.44) |
| Urea | **0.13 (0.02–0.52)** | 0.00 (-0.01-0.14) | 0.13 (-0.84–1.94) |

Results were obtained by causal mediation analysis. Effects are reported as proportion mediated of the association between educational attainment (low versus high) and outcomes via each mediator. aEstimates were adjusted for age, gender, eGFR and UACR. The significance of the effect was computed using bootstrapping procedures and are estimated from 1000 simulations. Bold values indicate statistical significance.

Abbreviations: BAP, bone-specific alkaline phosphatase; BMI, body mass index; BP medic, blood pressure medication; CRP, C-reactive protein; CVD, cardiovascular disease; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate using based on CKD-EPI equation; HDL, high-density lipoprotein; H-FABP, heart-type fatty acid binding protein; hs-TropT, high-sensitive troponin T; iPTH, intact plasma parathyroid hormone; NGAL, neutrophil gelatinase-associated lipocalin; NT-proBNP, N-terminal pro-B-type natriuretic peptide; OPN, osteopontin; SBP, systolic blood pressure; UACR, urine albumin-to-creatinine ratio.

**References:**

1. Heindel, J., et al., *Association Between Dietary Patterns and Kidney Function in Patients With Chronic Kidney Disease: A Cross-Sectional Analysis of the German Chronic Kidney Disease Study.* J Ren Nutr, 2020. **30**(4): p. 296-304.

2. Kaesler, N., et al., *Low adherence to CKD-specific dietary recommendations associates with impaired kidney function, dyslipidemia, and inflammation.* Eur J Clin Nutr, 2021.

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

|  |  |  |  |
| --- | --- | --- | --- |
|  | Item No | Recommendation | Page No |
| **Title and abstract** | 1 | (*a*) Indicate the study’s design with a commonly used term in the title or the abstract | 3 |
| (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 3 |
| Introduction | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 5 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 5 |
| Methods | | | |
| Study design | 4 | Present key elements of study design early in the paper | 7 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 7-10 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up | 7 |
| (*b*)For matched studies, give matching criteria and number of exposed and unexposed |  |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 8 |
| Data sources/ measurement | 8\* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 8 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 7-10 |
| Study size | 10 | Explain how the study size was arrived at | 7 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 9-10 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 9-10 |
| (*b*) Describe any methods used to examine subgroups and interactions |  |
| (*c*) Explain how missing data were addressed |  |
| (*d*) If applicable, explain how loss to follow-up was addressed |  |
| (*e*) Describe any sensitivity analyses |  |
| Results | | |  |
| Participants | 13\* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | Figure S1 |
| (b) Give reasons for non-participation at each stage |  |
| (c) Consider use of a flow diagram |  |
| Descriptive data | 14\* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | Table 1 |
| (b) Indicate number of participants with missing data for each variable of interest |  |
| (c) Summarise follow-up time (eg, average and total amount) |  |
| Outcome data | 15\* | Report numbers of outcome events or summary measures over time | 12, Fig. 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | Fig. 2 |
| (*b*) Report category boundaries when continuous variables were categorized |  |
| (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |  |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | Supp Table S1, |
| Discussion | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 14 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 17-19 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 17-18 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 17-18 |
| Other information | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 19 |

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.