**Healthy and Unhealthy Dietary Patterns and Chronic Disease: An Umbrella Review of Meta-Analyses of Prospective Cohort Studies**

**Supplementary material** including **Supplementary** Tables 1-5, Supplementary References, and PRISMA checklists

**Supplementary Table 1**. Search strategy to find published meta-analyses of dietary patterns and chronic diseases (September/5/2019)

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| --- |
| **PubMed** (710)  |
| (((("Food Habits") OR ("Food Habit") OR ("dietary Habits") OR ("dietary Habit") OR ("dietary pattern") OR ("dietary patterns") OR ("Western pattern") OR ("Prudent pattern") OR ("conservative pattern") OR ("traditional pattern") OR ("eating pattern") OR ("eating patterns") OR ("food intake pattern") OR ("food intake patterns") OR ("healthy pattern") OR ("unhealthy pattern") OR ("healthy dietary pattern") OR ("unhealthy dietary pattern") OR ("western dietary pattern") OR ("Prudent dietary pattern") OR ("traditional dietary pattern") OR ("conservative dietary pattern") OR (vegetarian) OR (“plant-based”)))) AND ((("systematic review") OR ("meta-analysis"))) |
| **Scopus** (773) |
| TITLE-ABS("Food Habits") OR TITLE-ABS ("Food Habit") OR TITLE-ABS("dietary Habits") OR TITLE-ABS("dietary Habit") OR TITLE-ABS("dietary pattern") OR TITLE-ABS("dietary patterns") OR TITLE-ABS("Western pattern") OR TITLE-ABS("Prudent pattern") OR TITLE-ABS("conservative pattern") OR TITLE-ABS("traditional pattern") OR TITLE-ABS("eating pattern") OR TITLE-ABS("eating patterns") OR TITLE-ABS("food intake pattern") OR TITLE-ABS("food intake patterns") OR TITLE-ABS("healthy pattern") OR TITLE-ABS("unhealthy pattern") OR TITLE-ABS("healthy dietary pattern") OR TITLE-ABS("unhealthy dietary pattern") OR TITLE-ABS("western dietary pattern") OR TITLE-ABS("Prudent dietary pattern") OR TITLE-ABS("traditional dietary pattern") OR TITLE-ABS("conservative dietary pattern")OR TITLE-ABS(vegetarian)OR TITLE-ABS(“plant-based”)ANDTITLE-ABS("systematic review") OR TITLE-ABS("meta-analysis") |

**Supplementary Table 2**. List of excluded studies.

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| **Reason for exclusion** |
| In patients ([1](#_ENREF_1); [2](#_ENREF_2); [3](#_ENREF_3)) |
| Meta-analyses of studies other than prospective cohort studies ([4](#_ENREF_4); [5](#_ENREF_5); [6](#_ENREF_6); [7](#_ENREF_7); [8](#_ENREF_8); [9](#_ENREF_9); [10](#_ENREF_10); [11](#_ENREF_11); [12](#_ENREF_12)) |
| Meta-analyses with only one prospective cohort study ([13](#_ENREF_13); [14](#_ENREF_14); [15](#_ENREF_15); [16](#_ENREF_16)) |
| Not relevant exposure ([17](#_ENREF_17)) |
| Systematic reviews without meta-analysis ([18](#_ENREF_18); [19](#_ENREF_19); [20](#_ENREF_20)) |
| Meta-analyses of vegetarians ([21](#_ENREF_21); [22](#_ENREF_22); [23](#_ENREF_23); [24](#_ENREF_24); [25](#_ENREF_25); [26](#_ENREF_26); [27](#_ENREF_27); [28](#_ENREF_28); [29](#_ENREF_29)) |
| Duplicates (meta-analyses that assessed the same outcome) ([30](#_ENREF_30); [31](#_ENREF_31); [32](#_ENREF_32); [33](#_ENREF_33); [34](#_ENREF_34); [35](#_ENREF_35); [36](#_ENREF_36); [37](#_ENREF_37); [38](#_ENREF_38); [39](#_ENREF_39); [40](#_ENREF_40); [41](#_ENREF_41); [42](#_ENREF_42); [43](#_ENREF_43); [44](#_ENREF_44); [45](#_ENREF_45); [46](#_ENREF_46); [47](#_ENREF_47); [48](#_ENREF_48); [49](#_ENREF_49); [50](#_ENREF_50); [51](#_ENREF_51); [52](#_ENREF_52); [53](#_ENREF_53); [54](#_ENREF_54)) |

**Supplementary Table 3.** Detailed evaluation of the methodological quality with AMSTAR1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author (ref), year** | **Outcome** | **Q1**2 | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** | **Q7** | **Q8** | **Q9** | **Q10** | **Q11** | **All** |
| Alhazmi 29, 2014 | Type 2 diabetes | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 9 |
| Esposito 30, 2014  | Type 2 diabetes | Yes | Yes | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Fabiani 31, 2019 | Fracture | Yes | Yes | Yes | CA | Yes | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Fabiani 32, 2019 | Metabolic syndrome | Yes | Yes | Yes | CA | Yes | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Garcia-Larsen 33, 2018 | Colorectal cancer | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Godos 34, 2016 | Colorectal adenoma | Yes | Yes | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Grosso 35, 2017 | Pancreatic, gastric, and prostate cancers | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | Yes | Yes | 8 |
| Hou 36, 2015 | Coronary heart disease | Yes | Yes | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Li 37, 2015 | All-cause and cardiovascular mortality | Yes | Yes | No | No | No | Yes | No | No | Yes | Yes | Yes | 6 |
| Lv 38, 2014 | Asthma | Yes | Yes | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Molendijk 39, 2018 | Depression | Yes | No | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 7 |
| Rashidi Pour Fard 40, 2019 | Frailty | Yes | Yes | Yes | CA | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| Rodríguez-Monforte 41, 2015 | Stroke | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | Yes | 7 |
| Sun 42, 2016 | Lung cancer | Yes | Yes | Yes | CA | No | Yes | Yes | Yes | Yes | Yes | Yes | 9 |
| Xiao 43, 2019 | Breast cancer | Yes | Yes | Yes | CA | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10 |
| Zheng 44, 2016 | Chronic obstructive pulmonary disease | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | 8 |
| 1Reference numbers are related to the main text.2 Q1: Was an ‚a priori‘ design provided?, Q2: Was there duplicate study selection and data extraction?, Q3: Was a comprehensive literature search performed?, Q4: Was the status of publication (i.e. grey literature) used as an inclusion criterion?, Q5: Was a list of studies (included and excluded) provided?, Q6: Were the characteristics of the included studies provided?, Q7: Was the scientific quality of the included studies assessed and documented?, Q8: Was the scientific quality of the included studies used appropriately in formulation conclusions?, Q9: Were the methods used to combine the findings of studies appropriate?, Q10: Was the likelihood of publication bias assessed?, Q11: Was the conflict of interest included?**Abbreviations**:CA, can’t answer; Q, Question; ref, reference number in the main text. |

**Supplementary Table 4**: Scoring for the different components of NutriGrade for each outcome1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author (ref), year** | **Exposure** | **Outcome** | **Risk of bias**2 | **Precision**3 | **Heterogeneity**4 | **Directness**5 | **Publication bias**6 | **Funding bias**7 | **Effect size**8 | **Dose-response**9 | **Sum** | **NutriGrade**  |
| Alhazmi 29, 2014 | Unhealthy pattern | Type 2 diabetes | 1.5 | 1 | 0.8 | 1 | 1 | 1 | 1 | 0 | 7.3 | Moderate |
| Esposito 30, 2014  | Healthy pattern  | Type 2 diabetes | 2 | 1 | 0.8 | 1 | 1 | 0.5 | 0 | 0 | 6.3 | Moderate |
| Fabiani 31, 2019 | Healthy pattern | Fracture | 1.5 | 1 | 0.4 | 1 | 0.5 | 1 | 1 | 0 | 6.4 | Moderate |
| Fabiani 31, 2019 | Unhealthy pattern | Fracture | 1.5 | 1 | 0.4 | 1 | 0.5 | 1 | 1 | 0 | 6.4 | Moderate |
| Fabiani 32, 2019 | Healthy pattern | Metabolic syndrome | 1.5 | 1 | 0.6 | 1 | 0 | 1 | 0 | 0 | 5.1 | Low |
| Fabiani 32, 2019 | Unhealthy pattern | Metabolic syndrome | 1.5 | 1 | 0.6 | 1 | 0 | 1 | 1 | 0 | 6.1 | Moderate |
| Garcia-Larsen 33, 2018 | Healthy pattern | Colorectal cancer | 2 | 1 | 0.6 | 1 | 1 | 1 | 0 | 0 | 6.6 | Moderate |
| Garcia-Larsen 33, 2018 | Unhealthy pattern | Colorectal cancer | 2 | 0 | 0.6 | 1 | 1 | 1 | 0 | 0 | 5.6 | Low |
| Godos 34, 2016 | Healthy pattern | Colorectal adenoma | 1.5 | 0 | 0.5 | 1 | 0 | 1 | 0 | 0 | 4 | Low |
| Godos 34, 2016 | Unhealthy pattern | Colorectal adenoma | 1.5 | 0 | 0.5 | 1 | 0 | 1 | 1 | 0 | 5 | Low |
| Godos 34, 2016 | Healthy pattern | Pancreatic cancer | 1.5 | 0 | 0.2 | 1 | 0 | 1 | 0 | 0 | 3.7 | Very low |
| Godos 34, 2016 | Unhealthy pattern | Pancreatic cancer | 1.5 | 0 | 0.4 | 1 | 0 | 1 | 0 | 0 | 3.9 | Very low |
| Grosso 35, 2017 | Healthy pattern | Pancreatic cancer | 1.5 | 0 | 0.3 | 1 | 0 | 1 | 0 | 0 | 3.8 | Very low |
| Grosso 35, 2017 | Unhealthy pattern | Pancreatic cancer | 1.5 | 0 | 0.3 | 1 | 0 | 1 | 0 | 0 | 3.8 | Very low |
| Grosso 35, 2017 | Healthy pattern | Prostate cancer | 1 | 0 | 0.5 | 1 | 0 | 1 | 0 | 0 | 3.5 | Very low |
| Grosso 35, 2017 | Unhealthy pattern | Prostate cancer | 1 | 0 | 0.3 | 1 | 0 | 1 | 0 | 0 | 3.3 | Very low |
| Hou 36, 2015 | Healthy pattern | Coronary heart disease | 1.5 | 1 | 0.6 | 1 | 0.5 | 1 | 0 | 0 | 5.6 | Low |
| Hou 36, 2015 | Unhealthy pattern | Coronary heart disease | 1.5 | 1 | 0.5 | 1 | 0.5 | 1 | 0 | 0 | 5.5 | Low |
| Li 37, 2015 | Healthy pattern | All-cause mortality | 1.5 | 1 | 0.4 | 1 | 0 | 1 | 1 | 0 | 5.9 | Low |
| Li 37, 2015 | Unhealthy pattern | All-cause mortality | 1.5 | 1 | 0.4 | 1 | 0.5 | 1 | 0 | 0 | 5.4 | Low |
| Li 37, 2015 | Healthy pattern | Cardiovascular mortality | 1.5 | 1 | 0.6 | 1 | 0.5 | 1 | 0 | 0 | 5.6 | Low |
| Li 37, 2015 | Unhealthy pattern | Cardiovascular mortality | 1.5 | 0 | 0.4 | 1 | 0.5 | 1 | 0 | 0 | 4.4 | Low |
| Lv 38, 2014 | Healthy pattern | Asthma | 1 | 0 | 0.5 | 0 | 0 | 1 | 0 | 0 | 2.2 | Very low |
| Lv 38, 2014 | Unhealthy pattern | Asthma | 1 | 0 | 0.2 | 0 | 0 | 1 | 0 | 0 | 2.2 | Very low |
| Molendijk 39, 2018 | Healthy pattern | Depression | 1 | 0 | 0.5 | 1 | 0.5 | 1 | 0 | 0 | 4 | Low |
| Molendijk 39, 2018 | Unhealthy pattern | Depression | 1 | 0 | 0.4 | 1 | 0.5 | 1 | 0 | 0 | 3.9 | Very low |
| Rashidi Pour Fard 40, 2019 | Healthy pattern | Frailty | 1.5 | 0 | 0.4 | 1 | 0 | 1 | 0 | 0 | 3.9 | Very low |
| Rodríguez-Monforte 41, 2015 | Healthy pattern | Stroke | 1.5 | 0 | 0.5 | 1 | 0.5 | 1 | 0 | 0 | 4.5 | Low |
| Rodríguez-Monforte 41, 2015 | Unhealthy pattern | Stroke | 1.5 | 0 | 0.8 | 1 | 0.5 | 1 | 0 | 0 | 4.8 | Low |
| Sun 42, 2016 | Healthy pattern | lung cancer | 1 | 0 | 0.4 | 0 | 0 | 1 | 1 | 0 | 3.4 | Very low |
| Xiao 43, 2019 | Healthy pattern | Breast cancer | 1.5 | 1 | 0.8 | 1 | 1 | 1 | 0 | 0 | 6.3 | Moderate |
| Xiao 43, 2019 | Unhealthy pattern | Breast cancer | 1.5 | 0 | 0.5 | 1 | 1 | 1 | 0 | 0 | 5 | Low |
| Zheng 44, 2016 | Healthy pattern | Chronic obstructive pulmonary disease | 1.5 | 0 | 0.5 | 0 | 0 | 1 | 1 | 0 | 4 | Low |
| Zheng 44, 2016 | Western pattern | Chronic obstructive pulmonary disease | 1.5 | 0 | 0.2 | 0 | 0 | 1 | 0 | 0 | 2.7 | Very low |
| 1Reference numbers are related to the main text.2 Modifications of original NutriGrade-scoring system: Study quality Newcastle Ottawa Scale: ≥8 (2 points); ≥7-<8 (1.5 points), ≥6-<7(1 point).3 Modifications of original NutriGrade-scoring system: >5000 cases and the 95%CI excludes the null value (1 point), <5000 cases or >5000 cases but 95%CI includes the null value (0 point).4 0 to 1 point on the basis of *I*2.5 No important differences in the population or hard clinical outcomes (1 point), important differences in the population (0 point).6 <5 studies or sever evidence of bias or publication bias not assessed (0 point), no evidence of bias for 5-9 studies or moderate evidence of bias for ≥10 studies (0.5 point), no evidence of bias for ≥10 studies (1 point).7 Funded by academic institutions or research institutions (1 point), funded by private institutions, foundations, or nongovernmental organizations (0.5 point), Industry funding or conflict of interest (0 point).8 No effect (RR: 0.80–1.20) when comparing the highest vs. lowest category (0 point), moderate effect size (RR: <0.80–0.50 and >1.20–2, and corresponding test is statistically significant) when comparing the highest vs. lowest category (0.5 point), large effect size (RR: <0.50 and >2.00, and corresponding test is statistically significant) when comparing the highest vs. lowest category (1 point).9 No dose-response analysis or dose-response analysis with corresponding statistical test nonsignificant (0 point), significant linear or nonlinear dose-response relationship (1 point). |

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| **Section/topic**  | **#** | **Checklist item**  | **Reported on page #**  |
| **TITLE**  |  |
| Title  | 1 | Identify the report as a systematic review, meta-analysis, or both.  | 1 |
| **ABSTRACT**  |  |
| Structured summary  | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.  | 2,3 |
| **INTRODUCTION**  |  |
| Rationale  | 3 | Describe the rationale for the review in the context of what is already known.  | 4-5 |
| Objectives  | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).  | 5 |
| **METHODS**  |  |
| Protocol and registration  | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.  | None. |
| Eligibility criteria  | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.  | 6 |
| Information sources  | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.  | 5-6 |
| Search  | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.  | Supplementary Table 1 |
| Study selection  | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).  | 9, and Figure 1 |
| Data collection process  | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.  | 6-7 |
| Data items  | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.  | 6-7 |
| Risk of bias in individual studies  | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.  | 7-8 |
| Summary measures  | 13 | State the principal summary measures (e.g., risk ratio, difference in means).  | 8 |
| Synthesis of results  | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I2) for each meta-analysis.  | 8-9 |

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|  |  |  |  |
| --- | --- | --- | --- |
| **Section/topic**  | **#** | **Checklist item**  | **Reported on page #**  |
| Risk of bias across studies  | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).  | 8-9 |
| Additional analyses  | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.  | Not applicable |
| **RESULTS**  |  |
| Study selection  | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.  | 9, Figure 1 |
| Study characteristics  | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.  | Table 2 |
| Risk of bias within studies  | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).  | Tables 2-5 |
| Results of individual studies  | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.  | Tables 2-5 |
| Synthesis of results  | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency.  | Tables 2-5 |
| Risk of bias across studies  | 22 | Present results of any assessment of risk of bias across studies (see Item 15).  | Tables 2-5 |
| Additional analysis  | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).  | Tables 2-5 |
| **DISCUSSION**  |  |
| Summary of evidence  | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).  | 13-17 |
| Limitations  | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).  | 18-19 |
| Conclusions  | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research.  | 20-21 |
| **FUNDING**  |  |
| Funding  | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.  | 21 |