Dietary Patterns and Survival to 100+ Years

Protocol for a Systematic Review of cohort and case-control studies

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Systematic review – Protocol

Winnie Poulsen, 2021.

1.0 Administrative information

1.1 Review title

Dietary Patterns and Survival to 100+ Years: Protocol for a Systematic Review of cohort and case-control studies

1.2 Title in original language

Kostmønstre og overlevelse til 100+ år: Protokol for en systematisk oversigtsartikel af kohorte- og case-kontrolstudier

1.3 Type of review

Systematic literature review

1.4 Review team members

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Contributions

Christine Dalgård assumes the overall responsibility of the integrity of the scientific work as the guarantor. Winnie Poulsen composed the manuscript of the protocol. Kaare Christensen is the originator to the objectives and research question of this systematic review.

1.5 Amendments

If this protocol needs to be amended, changes will be noted in a separate section from the original protocol. The date of change, the section(s) involved, the language in the original protocol, a description of

the change, and a rationale for how the change is expected to improve the systematic review will be provided.

1.6 Support

Funding: The work on the review by WP is supported by a grant from the National Institute on Aging at National Institutes of Health, NIH/NIA U19-AG063893.

Sponsor's role: The funding agency did not have any role in the development of this protocol, will have no role in the conduct of the review, in the data analysis process, in interpretation of the results or in decisions regarding dissemination.

2.0 Introduction

2.1 Rationale

Human life span is influenced by genetic, epigenetic, environmental, and lifestyle factors, and has large variation (1). Lifestyle factors such as tobacco use, use of alcohol, physical activity, and diet are influencing lifespan in adult populations by affecting the risk of developing non-communicable diseases (2, 3). The association between dietary habits and survival among middle-aged and younger elderly is well-documented (4-6) while the association is much less studied in the oldest-old and in particular in centenarians – despite centenarians are widely used as a model for healthy aging (7-9). Currently only few systematic reviews and meta-analyses investigating associations between various dietary patterns and survival among the oldest have been performed, and all with a focus on younger elderly. Bonaccio et al. conducted a meta-analysis in 2018 including prospective studies assessing mortality risk associated with adherence to the Mediterranean Diet among participants aged ≥65 years (10). In 2019 Soltani et al. investigated the same association while including participants ≥18 years in a systematic review and meta-analysis (11). Soltani et al. also conducted a systematic review and meta-analysis in 2020; investigating associations between adherence to the dietary approach to stop hypertension (DASH) and mortality among participants ≥18 years (12). Both Bonaccio et al. (2018) and Soltani et al. (2019) found a linear inverse relation between the Mediterranean Diet Score and the risk of all-cause mortality (4, 5), and Soltani et al. (2020) similarly found a protective effect on the risk of all-cause mortality from adherence to the DASH-diet emerging in a linear inverse relation (6).

However, no systematic review exists on dietary habits in relation to survival to 100+ years.

To this end this systematic review aims to investigate the dietary habits of centenarians during their adult life to identify dietary patterns associated with exceptional survival.

2.2 Objectives

The objectives of this systematic review are to investigate associations between different dietary patterns and survival to 100+ years, and to explore potential common characteristics across dietary patterns that are shown to be positively associated with this exceptional lifespan.

Hence, this study aims to investigate

1. the association between dietary patterns in adult life and survival to 100+ years
2. the common characteristics across dietary patterns that are shown to be positively associated with survival to 100+ years

3.0 Methods

3.1 Eligibility criteria

Studies will be found eligible according to the following criteria:

Study designs

Studies using a pro- or retrospective cohort design (including multi-center cohort study design) and case-control studies will be included.

Cross-sectional studies, case series, case reports, and studies with experimental designs, as well as qualitative studies will be excluded.

We implement no eligibility criteria regarding sample size.

Participants

Studies conducted upon populations from all parts of the world will be considered. We will include studies examining individuals aged 65 years or older at enrollment. Studies that have enrolled specific age ranges above 65 years will also be considered e.g. studies on nonagenarians and octogenarians. We will include studies regardless of the participants' health status at enrollment, e.g. healthy individuals, patients with chronic diseases and survivors of cancer(s). We will also include studies regardless of the participants' residence, e.g. community-dwelling and institutionalized individuals.

Studies including both individuals younger and older than 65 years in the study population will also be considered, if data on participants aged 65 years or older at enrollment are presented separately.

Studies conducted on non-human species will be excluded, e.g. studies on animals or model organisms.

Exposure

Studies assessing dietary patterns will be included.

Studies measuring only elements of dietary patterns, e.g. specific foods, drinks, or nutrients, will be excluded. Studies measuring only serum concentrations of substances, e.g. metabolites, will also be excluded.

Outcomes

The outcome of interest to this study is survival to at least 100 years.

Studies investigating the association between various parameters and longevity primarily employ mortality as outcome measure. This study will consider only all-cause mortality defined as death from any cause.

Studies with only mediating endpoints to survival or mortality as outcome including genetic, biochemical, physiological, social, and cognitive markers as well as specific diseases and disabilities will be excluded. Studies examining mortality and other outcomes concurrently will be included if data on all-cause mortality is reported separately.

Timing

We employ no eligibility criteria based on length of follow-up.

Years published

We employ no exclusion criteria related to which year studies have been published.

Language

Studies in English, Danish, Swedish, and Norwegian will be considered.

Publication status

We include only published materials.

Publication types

Only primary studies will be included. This means we will exclude all types of reviews and meta-analyses, conference abstracts, editorials, letters, and commentaries.

3.2 Information sources

This study will include systematic literature searches in two general electronic biomedical databases, MEDLINE and EMBASE.

In an unpublished preliminary search for systematic reviews on dietary patterns and exceptional survival, we identified a range of projects collecting longitudinal observational data on diet from populations of different older age ranges. Potentially some of these projects have data on diet in centenarians. Therefore, additional to the literature search in electronic databases, we will search for publishing lists at project-homepages and scan these lists for additional literature. The identified projects and homepages are as follows:

- Leiden Longevity Study, http://www.leidenlangleven.nl/en/home
- Life and Living in Advanced Age Study, https://www.fmhs.auckland.ac.nz/en/faculty/lilacs.html
- Chinese Longitudinal Health Longevity Study https://www.icpsr.umich.edu/web/NACDA/series/487/publications
- Japan Semi-Supercentenarian Study http://www.keio-centenarian.com/english/research/jss

The search will be supplemented by scanning the reference lists of the included studies.

Searches in electronic databases and at homepages took place the 4th June 2021.

3.3 Search strategy

The search strategy was developed by WP through preliminary searches for systematic reviews on longevity, preliminary searches for primary studies on dietary patterns and longevity, and guided by a health information specialist with experience in conducting systematic literature searches at the Library at University of Southern Denmark. See tables 1 and 2 for the search strategies for EMBASE and MEDLINE respectively. Facet # 3 is an implementation of the Ovid Expert Search Filters for focused searches on elderly in EMBASE and MEDLINE respectively (13). The draft for the search strategy was subsequently reviewed by KC and CD.

Table 1: Search matrix for search in EMBASE (Ovid)

Facet	# 1 Dietary pattern	# 2 Longevity	# 3 Elderly
Search	Exp diet/ or exp dietary pattern/ or exp geriatric nutrition/ or diet*.mp.	Exp longevity/ or exp overall survival/ or exp all cause mortality/ or longevity.mp. or overall survival.mp. or mortality.mp.	exp *aged/ or exp *geriatrics/ or exp *elderly care/ or (centarian* or centenarian* or elder* or eldest or frail* or geriatri* or nonagenarian* or octagenarian* or octogenarian* or old age* or older adult* or older age* or older female* or older male* or older man or older men or older patient* or older people or older person* or older population or older subject* or older woman or older women or oldest old* or senior* or senium or septuagenarian* or supercentenarian* or very old*).ti,kw.

Table 2: Search matrix for search in MEDLINE (Ovid)

Facet	# 1 Dietary pattern	# 2 Longevity	# 3 Elderly
Search	Exp diet/ or diet*.mp.	Exp longevity/ or exp mortality/ or longevity.mp. or overall survival.mp. or mortality.mp.	exp *aged/ or exp *geriatrics/ or exp *geriatric nursing/ or (centarian* or centenarian* or elder* or eldest or frail* or geriatri* or nonagenarian* or octagenarian* or octogenarian* or old age* or older adult* or older age* or older female* or older male* or older man or older men or older patient* or older people or older person* or older population or older subject* or older woman or older women or oldest old* or senior* or senium or septuagenarian* or supercentenarian* or very old*).ti,kf

3.4 Study records

The search results will be exported to Endnote X9. Articles retrieved from project-homepages that are anticipated to be eligible based on title screening will also be exported to Endnote X9. Endnote X9 will then be used for duplicate removal. Next, the remaining references will be exported to the internet-based software for systematic review management, Covidence, at www.covidence.org. Covidence will

automatically run a duplicate removal process while importing references. Thereafter, any potentially unidentified remaining duplicates will be removed manually during the screening process. The process of screening titles and abstracts against the inclusion and exclusion criteria will be undertaken in Covidence by WP. Doubts will be resolved through discussion with CD. Studies appearing to meet the inclusion criteria and studies where any uncertainty about this exists will be re-exported to Endnote X9, where the function "Find Full Text" will be used to obtain full text articles. Potentially missing articles will be downloaded individually subsequently. Full text reports will then be screened by WP to decide whether each study meet the inclusion criteria. Doubts will be resolved through discussion with CD. Reference lists of included studies will be screened for additional eligible literature.

Inclusion or exclusion will be documented in Covidence throughout the process. Covidence then contains all necessary data to construct a PRISMA flow diagram illustrating the inclusion/exclusion process, by using the PRISMA function in this software.

3.5 Data items

The following data items will be extracted from the included studies and presented in a summary of findings-table:

- First author and year of publication
- Country and population setting
- Health status and population residence at enrollment
- Sample size
- Age criteria for enrollment and mean age
- Follow-up duration
- Dietary pattern, assessment method, number of items
- Food groups and/or nutrients included in the dietary pattern
- Method for ascertainment of outcome
- Person years
- RR/HR/OR/Rate ratios (95 % CI) - adjusted
- Adjustment variables
- Quality assessment/risk of bias

For the purpose of describing dietary patterns of different populations and assessing the quality of these, a plethora of diet quality indices have been developed (14). Even within one dietary pattern, e.g. the Mediterranean Diet, several different definitions have been developed with different scoring criteria (15). Further, as a natural consequence of a posterior methods to describe and assess the quality of diets, the definitions of these dietary patterns vary from study to study (16-18). The definition of dietary patterns in this review must be sufficiently broad to encompass the variety in definitions of dietary patterns used in primary studies. In the light of this, we employ the following definition of dietary patterns as suggested by the United States Agricultural Department:

"The quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed." (19, p. 9)

The outcome measure investigated in this review is all-cause mortality. The objective is to explore the influence of different dietary patterns on survival to at least 100 years. Studies have shown that dietary

patterns affect the risk for non-communicable diseases (20), which affects the risk of death (12) and hence the length of life. This study focuses on effects of dietary patterns on the mortality risk or survival without examining possible mediating factors between dietary patterns and death. Accordingly, the outcome that will be extracted from the included primary studies is mortality from all causes/all-cause mortality/overall mortality/total mortality.

There are no secondary outcomes in this review.

An extraction form will be created in Covidence. The extraction form will be piloted to test its completeness. If needed, the extraction form will be edited before the data extraction is started. WP will perform the data extraction and CD will review the completed extraction form looking for wrongly entered numbers and missing information. The completed extraction form will be exported to Excel where notes will be added to construct the final summary of findings-table.

3.6 Risk of bias in individual studies

The Newcastle-Ottawa Quality Assessment Scales (NOS) for cohort studies and case-control studies respectively will be used as a tool for assessing the risk of bias in the included studies. By the application of these tools, studies can be given up to nine stars through evaluation of three main domains: Selection and comparability for both study types, and outcome or exposure for cohort studies and case-control studies respectively (21).

WP will perform the risk of bias assessment. Doubts will be discussed with CD.

3.7 Data synthesis

We will perform a narrative synthesis of results.

For both research questions, results will be presented according to the bias assessment. Results from studies assessed to be at low risk of bias will be presented first followed by results from studies assessed to be at higher risk of bias. We do not omit studies at high risk of bias.

First, results extracted to answer research question number one will be synthesized in the following order:

- Based on dietary patterns beginning with a priori-based patterns followed by patterns derived by a posterior-approaches. For patterns that are alike and have been explored in populations of different geographical areas, results will also be summarized on country-level.
- Divided into health status groups starting with individuals being healthy at baseline followed by patient groups.

Next, results extracted to answer research question number two will be synthesized as follows:

Dietary patterns that in the first part of the data synthesis have been shown to be positively associated with survival to 100 years or longer, will be analyzed according to food groups. Common characteristics on a food group-level will be summarized in a Venn-diagram illustrating overlapping characteristics and characteristics restricted to single dietary patterns.

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