
Title registration for a systematic review: The effect of whole-grain dietary intake on non-communicable diseases: a systematic review

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- Crime and Justice
- Education
- Disability
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Plans to co-register:

- No
- Yes Cochrane Other
- Maybe

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Title of the review

The effect of whole-grain dietary intake on non-communicable diseases: a systematic review

Background

Wheat, rye, oats, barley and other varieties of grains are some of the most important staples in the human diet. With wheat alone contributing up to 68% of world food supplies, this has led to the increasing interest in the health effects of grains, in particular whole grains (WG) (Curtis et al, 2002). WGs are defined as containing all of the anatomical components of the grain including the bran, endosperm and germ (Van der Kamp et al, 2014). WGs unlike refined grains are associated with favourable reductions in diabetes, cardiovascular disease (CVD), cancer and mortality. Some studies show both a weak and strong association but there are now a large amount of reviews (both systematic and meta-analysis) which appear to show the latter (McRae, 2016). Despite existing evidence current systematic reviews and meta-analyses fail to acknowledge the main health effects in a single paper (i.e. diabetes, cancer, mortality, cardiovascular disease, obesity). This leaves the effects of WG open for more than one interpretation which serves to confuse the scientific community and public.

It is now common for researchers to report summary measures such as risk ratios, hazard ratios, incident ratios and odds ratio. Although they provide valuable information, they often limit readers understanding, can be falsely interpreted and do not provide information on underlying mechanisms (Knol et al, 2012). Non-communicable diseases (NCD) such as metabolic syndrome and CVD defined as a cluster of multiple factors such as obesity, overweight, dyslipidemia and impaired glucose homeostasis (Alberti et al, 2005). Biomarkers can provide more accurate information on an individual or population at risk of certain NCDs. To our knowledge there is no meta-analysis on WG which has explored the relationship between these multiple factors and WG intake.

The proposed review will not only help alleviate controversy surrounding the health effects of WGs but help collate more accurate recommendations. The EU Healthgrain Forum (www.healthgrain.org) has proposed standardised definitions of WG and WG-foods (Van der Kamp et al, 2014; Ross et al, 2017). However, in many other continents WGs are defined differently or not defined at all. It is hoped that a dose-response analysis (or meta-regression) using these standardised definitions will encourage governments to adopt similar definitions and set new targets for WG intake in order to improve population health.

Objectives

Our primary research questions are:

1. What is the cumulative effect of WG intake on non-communicable diseases (i.e. diabetes, cardiovascular disease, obesity, cancer, mortality and hypertension) ?
2. To what extent can a more accurate assessment of the effects of WG be made by pooling biomarkers of NCD?

Our secondary research question is:

3. To what extent can a dose-response analysis be used to provide better information on the relationship between multiple biomarkers of NCD risk and be used to support universal definitions of WG and WG-foods and set new dietary guidelines for WG intake?

Existing reviews

1. Whole grain consumption and risk of cardiovascular disease, cancer and all cause and case specific mortality: systematic review and dose-response meta-analysis of prospective studies (Aune et al, 2016)
2. Greater Whole-Grain Intake Is Associated with Lower Risk of Type 2 Diabetes, Cardiovascular Disease, and Weight Gain (Ye et al, 2012)
3. Whole-grain and blood lipid changes in apparently healthy adults: a systematic review and meta-analysis of randomized controlled studies (Hollaender et al, 2015)
4. Whole grain and body weight changes in apparently healthy adults: a systematic review and meta-analysis of randomized controlled studies (Po et al, 2013)
5. Whole grain cereals for the primary or secondary prevention of cardiovascular disease (Kelly et al, 2017)
6. Whole-grain intake as a marker of healthy body weight and adiposity. (Harland et al, 2008)

There are many systematic reviews and meta-analyses which look at the effects of WG on health outcomes. However, it is believed that there is no review which attempts to encompass a broad range of diseases. Aune et al (2016) and Ye et al (2012) are believed to be the only systematic reviews and meta-analyses that try to attempt this. Hollaender et al (2015), Po et al (2013), Kelly et al (2017) and Harland et al (2008) are believed to be the only systematic reviews and meta-analyses that look at a few biomarkers of different NCDs in the same analysis. Although, they all provide a dose-response and meta-analysis, none of them look at a range of biomarkers. Therefore, the evidence across diseases is less compelling on the effects of WG and the mechanisms of action in the human body.

Intervention

Participants and intake:

Most current interventions and cohorts consider WG intake as foods containing 25% or 30% WG weight depending on the definition adopted (Jacobs et al, 2007; Liu et al, 1999; Liu et al 2003). Cohorts attempt to measure total WG intake whereas interventions attempt to give WG specific food or a range of WG foods in order to mimic normal consumption. Participants tend to be either sex depending on the disease being investigated (e.g. men for prostate cancer and women for breast cancer) but most studies tend to be randomly selected cases and/or healthy individuals from a population (Nimptsch et al, 2011; Mourouti et al, 2016). Studies mostly compare high WG intakes to low WG intakes. The lowest group in the interventions and cohorts consume the least WG without intervention or are assigned to a placebo such as refined grains; both are normally assumed to be zero grams WG intake (Kirwan et al, 2016; Jacobs et al, 2007). There are many interventions that involve modified test foods such as WGs with added fiber which should not be confused with regular WG intake (Liatis et al, 2009). In the proposed review these studies will be excluded. Some studies also report all grains that are not separated into refined and WGs (Lewis et al, 2009; Deneo-Pellegrini et al, 1999). These will not be considered unless the intake for only WG can be isolated.

Study populations:

All population types from all ages, sex and demographics are considered in interventions, cohorts and case-controls. In some cases, there is more than one study which investigates different diseases using the same population (e.g. The Nurses Health study) (Liu et al, 1999; He et al, 2010). Only the most up to date study with the largest population or the longest period of follow-up will be chosen to avoid duplicating data. Populations from low, middle and high income countries will be considered. However, there are very few studies that look at the effects of WG on NCDs in low income countries. Most studies are based on middle and high income countries such as the USA and European countries (Liu et al, 1999; H et la, 2010; Aarestrup et al, 2012; Landberg et al, 2010). WG intake has been shown to vary greatly within these regions still. For instance, Scandinavian countries consume on average 36 and 43g/day for women and men but this is below 15g/day for the UK, France and Spain (Ross et al, 2017). Globally this has been estimated to be 38.4g/day (Micha et al, 2015). A moderator analysis will be conducted to assess these country specific variations. Studies will be stratified by follow-up, sex, geographical location, number of cases, dietary assessment, study quality and adjustment for confounding factors.

Outcomes

Biomarkers and measurements such as serum fasting glucose, fasting insulin, cholesterol (i.e. low-density-lipoprotein and high-density-lipoprotein), triacylglycerols, inflammation (e.g. C-reactive protein, interleukins and tumor necrosis factor), homeostatic model of assessment (HOMA), quantitative insulin sensitivity index (QUICKI), body fat mass, fat free mass, body mass index and waist circumference will be considered as primary outcomes for a range of NCD such as obesity, diabetes, cardiovascular disease and hypertension. The meta-analysis will adopt a “barrow of strength” approach where biomarkers of one disease can help predict others (Riley et al, 2017). However, caution must be made when interpreting the final outcomes. To avoid possible misinterpretation outcomes will be stratified according to study topics (e.g. diabetes) and shown with and without a multivariate model. Secondary outcomes will include summary measures such as risk ratios, hazard ratios, odd ratios or incident ratios for diabetes, cancers, cardiovascular disease and all-cause-mortality. These will be collected for the main NCD outlined earlier but are especially important for NCDs such as cancer where biomarkers are not readily available.

Study designs

All cohorts, case-controls, controlled clinical trials (CCTs), randomised controlled trials (RCTs) and other observational studies in any language will be considered.

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Roles and responsibilities

Content: Chris Seal has written a number of articles on primary research of WGs and continues to strive towards elucidating the benefits and health effects of WGs to the public. Wasim Iqbal and Abigail Smith have recently worked on other research projects in relation to WGs and have shown a considerable interest in this area.

Systematic review methods: Gavin Stewart has considerable experience in the formation of systematic reviews and meta-analyses.

Statistical analysis: Gavin Stewart has considerable experience in statistical methods and is an expert in bayesian statistics. Wasim Iqbal has conducted relevant statistical analysis and is competent in R programming.

Information retrieval: Chris Seal, Wasim Iqbal and Abigail Smith are experienced in information retrieval and boolean searches.

Funding

We will not receive any financial support for this review.

Potential conflicts of interest

Chris Seal is a member of HEALTHGRAIN forum, is part of the board of trustees for the Nutrition Society, member of the Institute of Food Science and Technology (IFST) and the Association for the Study of Obesity.

Gavin Stewart is an editor for Peer J, research synthesis methods and Cochrane/Campbell collaborations.

Preliminary timeframe

Date you plan to submit a draft protocol: July 2018

Date you plan to submit a draft review: June 2019