Spring 2021

Sattvic diet and all-cause mortality: a systematic review

Nrsimha Ghosh
nkg14@uakron.edu

Sattvic diet and all-cause mortality: a systematic review

Abstract: A sattvic diet is a diet characterized by a moderate intake of food that is not reheated and is only eaten twice daily. It is mentioned in ancient Hindu scriptures such as the *Srimad Bhagavad-gita*. This paper aims to compare foods and habits considered to be sattvic with those considered to be rajasic and tamasic (those outside of the diet) in regard to all-cause mortality. Because of the many variable factors of all three diets, specific words mentioned in the texts were used to search Google Scholar, Agricola, Medline, Food Science Source, CINAHL Plus, Cochrane Library Online, PubMed, Health Source, Ovid Nursing & Health Profession Journals, Health Source, and Europe PMC databases along with the following keywords: mortality, all-cause mortality. Results were selected by title, then abstract, then full-text. Twelve results were included in relation to all-cause mortality. Sixty-five mixed results showed associations between different factors in a sattvic diet and health risks/benefits found. The resulting information did not lead to an association between all-cause mortality and a sattvic diet. Further studies are necessary to better understand and present the totality of a sattvic diet and its relation to mortality in general.

1. Introduction

1.1. Background

The word *"*Sattvic," or "Sattvikam", appears in many Hindu texts on Yoga, and is translated to "in the mode of goodness" in English.[1] In the *Srimad Bhagavad-gita's* Chapter 17, Text 7, it states that each food is placed into one of three categories, which coincide with the three modes of material nature: goodness (Sattva), passion (Rajas), and darkness (Tamas).[1] In the following three texts (verses) it states the following: "Foods in the mode of goodness increase the duration of life, purify one's existence and give strength, health, happiness and satisfaction. Such nourishing foods are sweet, juicy, fattening and palatable. Foods that are too bitter, too sour, salty, pungent, dry and hot, are liked by people in the modes of passion. Such foods cause pain, distress, and disease. Food cooked more than three hours before being eaten, which is tasteless, stale, putrid, decomposed and unclean, is food liked by people in the mode of ignorance."[1]

There are four divisions in Yogi Swatmarama's *Hatha Yoga Pradipika*, of which the fourth is *asanas* (posture) and food.[2] In the first chapter, verse 15, it states that the yoga forces that are sought after are dissipated by too much eating.[2 (p50)] Swami Sivananda of Rishikesh[2(p51)] said the stomach should be filled with one half food, one quarter water, and one quarter air. It is emphasized that one should eat what is necessary to maintain their bodily requirements.[2(p60)] Muktibodhananda Saraswati[2(p61)] says that performing austerity measures such as doing away with the luxury of tasty food helps mold the body and mind into a more sattvic state. The concept of Mitahara is present in Swatmarama's *Hatha Yoga Pradipika*. Mitahara means "sattvic food", which is light food that is easy to digest, fresh, pleasant tasting, and is sweet and agreeable.[2 (p135)]

Sweet food in this context does not particularly mean food that is sweet from its sugar content.[2] (p135) Agreeable food is food that is not bad tasting, poisonous, or disrupts one's metabolism.[2] (p135) Sattvic food is said to be light food, in the sense that heavy food is said to lead to a tamasic state and induces sleep.[2] (p135)

Chapter 1, Verse 59 of the *Hatha Yoga Pradipika* states the following: "The foods which are prohibited (for the yogi) are: those which are bitter, sour, pungent, salty, heating, green vegetables (other than those ordained), sour gruel, oil, sesame and mustard, alcohol, fish, flesh foods, curds, buttermilk, horse gram, fruit of jujube, oil cakes, asafetida and garlic."[2] (p137) There is a note that the reason for asafetida and garlic being unsalutary is their aphrodisiac properties.[2] (p137) Chapter 1, Verse 60 states: "Unhealthy diet should not be taken, that which is reheated after becoming cold, which is dry (devoid of natural oil), which is excessively salty or acidic, stale or has too many (mixed) vegetables." [2](p138) Chapter 1, Verse 62 states: "The most conducive foods for the yogi are: good grains, wheat, rice, barley, milk, ghee, brown sugar, sugar candy (crystallized sugar), honey, dry ginger, patola fruit (species of cucumber), five vegetables, mung and such pulses, and pure water." [2](p141) The five vegetables are thought to be the five categories of vegetables mentioned in the *Gheranda Samhita*'s Fifth Lesson, Verse 20: green, fresh vegetables, black vegetables, the leaves of patola, the Vastuku-saka, and hima-lochika saka.[3](p40) This ties into the earlier text mentioning the prohibition of green vegetables other than those ordained.

The same lesson further speaks about moderation of diet. Verse 16 states that without moderation of diet, various diseases will be incurred.[3](p40) Verse 17 through Verse 19 says that rice, barley, wheaten bread, mung beans, grain, patola, jackfruit, kakkola, jujube, bonduc nut, cucumber, plantain, unripe plantain, small plantain, plantain stem, plantain roots, eggplant, medicinal roots and fruits are allowed to be eaten.[3](p40) Verse 21 and Verse 22 state that half the stomach should be filled with food, one quarter should be filled with water, and one quarter should be left empty.[3](p40) Verse 32 states that food should be taken twice daily, once at noon and once in the evening.[3](p41)

In the following section, prohibited foods are stated. Verse 23 through Verse 25 say that the following foods should not be eaten: foods that are bitter, acidic, salty, pungent, or roasted, curd, whey, heavy vegetables, wine, palm nuts, over-ripe jack-fruit, kulattha, masur beans (split red or orange lentils), pandu fruit (java plum or *Syzygium cumini*), pumpkins, vegetable stems, gourds, berries, katha-bel (wood-apple or *Feronia elephantum*), kanta-bilva (bael fruit or *Aegle marmelos*), palasa (*Butea frondosa*), kadamba (*Nauclea cadamba*), jambira (citron), bimba (ivy gourd or *Coccinia grandis*), lukucha (monkey fruit or *Artocarpus lacucha),* onions, lotus (*Nelumbo nucifera*), kamaranga (star fruit or *Averrhoa carambola*), piyala (chirauli nut or *Buchanana latifolia*), hinga (asafoetida), salmali (*Bombax ceiba*), kemuka (crepe ginger or *Cheilocostus speciosus*), and very hot, stale, or putrid food.[3](p40)

In the first Prapathaka (lesson) of the *Maitrayaniya Upanishad*, the importance of sattva is explained: "Through Tapas [austerity], Sattva (quality) is acquired; through Sattva, a (pure) mind is acquired; and through mind, (Parama) Atma, (the higher Self) is reached. Through attaining Atma, one gets liberation."[4(p446)]

1.2. Rationale

Complementary and Alternative medicines have become significantly popular in the United States and Europe.[5,6] In recent years, and as a result, recent research has been conducted on constituents of a Sattvic diet—which comes from yoga. Those foods mentioned to be sattvic are said to "increase the duration of life".[1]

1.3. Objective

This review attempts to answer the question "is there an association with a sattvic diet and all-cause mortality?" on the bases of current scientific literature by comparing foods and habits that are considered sattvic with those that are considered rajasic and tamasic. This is believed to be the first review of a sattvic diet as a whole and its relation to mortality.

2. Methods

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used as a reference for this review.[7] Peer-reviewed, open-access reviews, studies, editorials, or responses were included. Letters, conference summaries, short communications, and books were excluded. Non-peer-reviewed results, results blocked by paywall, or results older than 10 years were excluded from the search.

2.1. Information sources

Google Scholar, Agricola, Medline, Food Science Source, CINAHL Plus, Cochrane Library Online, PubMed, Health Source, Ovid Nursing & Health Profession Journals, Health Source, and Europe PMC databases were searched. Lists of references were not scrubbed to find additional potentially relevant studies, but were checked to prevent overlap of studies in reviews. The final database search occurred on October 25, 2020.

2.2. Search strategy

Boolean operators ('AND' and 'OR') were used in combination with specific keywords of foods (*Appendix A*) and the following keywords: mortality, all-cause mortality—for all databases. All references were managed manually without the use of referencing software.

2.3. Study selection

Three passes were conducted in regard to the selection of articles for inclusion. For large databases such as Google Scholar, results past the first 100 were deemed irrelevant and not

reviewed. For all results up to and under 100, the title was skimmed for usage of relevant keywords used. If no relevant keywords were used, abstracts were read to determine eligibility. This completed the first pass. The second pass involved reading through abstracts of articles that were not previously read, as well as reference lists of reviews in order to remove duplicate studies. If the articles were found to meet the inclusion criteria upon further review, a third pass was made through the full texts or relevant sections. *Appendix B* shows the flow-chart for this process, of which twelve studies became eligible for final analysis.

2.4. Risk of bias across studies

Due to the large heterogeneity and stratification of studies included in this review as well as constituents of a sattvic diet, caution should be used when providing recommendations in regard to the efficacy of a sattvic diet.

3. Results and Discussion

3.1. Habits

3.1.1. Eating too much/Not enough

The link between overeating and obesity is already known; the body stores excess calories in the form of adipose tissue. Similarly, eating enough for bodily requirements is self-explanatorily necessary for survival as the alternative is death.

A recent systematic review and dose-response meta-analysis was published looking to quantify the association of central fatness and all-cause mortality.[8] The study reviewed 72 prospective cohort studies and found a significant association between central fatness and higher all-cause mortality risk.

Caloric restriction in the Okinawan population has been shown to likely extend health span and lifespan within their population.[9] However, when used as a prescribed nutrition support for critically-ill adults elsewhere, there was not a significant benefit found to caloric restriction.[10]

3.1.2. Eating more or less than twice daily

In addition, frequency of meals was inversely associated with all-cause mortality in a population-based (n = 6,884) prospective study.[11] Obesity was also inversely associated with frequency of meals. Mean age, mean total energy intake, percentage employment status, and percentage white ethnicity were positively associated with more frequent meals.

3.2. Foods

Because of the diversity and heterogeneity of studies/reviews in a review as complex as this, there is no efficient way to present evidence of all articles using the same factors. Thus, a discussion of results is used in place of a comparison of homogeneous data.

3.2.1. Sattvic foods

Wheat

While wheat flour appears to be significantly associated with vascular diseases, it is thought that it is not the wheat flour, but the factors often associated with it by culture—decreased physical activity and exposure to sunlight, increased social isolation and processed food consumption.[12]

Rice

White rice was shown to have a positive relation with diabetes and metabolic syndrome, but not cardiovascular disease (CVD) mortality.[13] White rice consumption was found to have a slight reduction in mortality risk of men.[14]

Barley/Dietary Fiber

While sufficient articles specifically relating to barley consumption were not found, a review (n = 1,409,014) on dietary fiber intake—barley contains 17 grams of fiber per 100 grams—found a significant negative inverse with CVD, congenital heart disease (CHD) and all cancers.[15]

Milk

One overview of meta-analyses and systematic reviews found that higher milk consumption was significantly associated with increased prostate cancer risk.[16, 17]However, these conclusions came from heterogeneous data. A notable inclusion is that higher cheese consumption was inversely associated with increased prostate cancer risk. The concluding notes stated that milk and dairy product consumption do not have significant evidence to form a conclusion, and more data is needed. Between the two reviews, two of the total 14 meta-analyses/systematic reviews were found to be duplicates. Between these two overviews and an assessment by Thorning,[18] four papers were duplicates, leaving 58 unique meta-analyses OR systematic reviews between the three overviews. The Thorning assessment found no significant association between milk or dairy consumption and CVD when consumed with an intake of 200-300 ml/day. An inverse association was stated to be found with risk of hypertension and stroke; however, the rest of the article does not accurately reflect that, as considerable heterogeneity and inconsistent findings were cited. Additionally, some evidence points to lower colorectal cancer incidence and mortality being associated with high dairy consumption, but more evidence is needed.[19]A review by Storhaug et al.[20] estimated global prevalence of lactose intolerance (lactose malabsorption) of 68%, with lower percentages for Western, Northern, and Southern European regions (19-37%). This level of lactose intolerance may be important in future findings.

Sugar (Brown Sugar/Crystallized Sugar)

Sugar as a sweetener has been shown to have a positive association with all-cause mortality in a review of five studies with 81,407 cases.[21] Data from the NIH-AARP Diet and Health Study found no association of added sugars and an increased risk of mortality.[22] A review of two Swedish population based prospective cohorts found an association between high sugar intake and increased mortality risk.[23] These results were specifically significant in the case of added sugars, but were inconsistent with the association between free sugar and all-cause mortality. These findings suggest that the sugar source is significant in determining relation to mortality; however, this does not fit the belief that crystallized sugar as a sattvic food is inversely associated with mortality.

Ginger (Dry ginger)

A review of anti-inflammatory, anti-cancer, anti-diabetic, and anti-oxidative stress effects of ginger found favorable results for intake of ginger and the aforementioned effects.[24]

Patola (*Luffa acutangula)*

Patola, or *Luffa acutangula,* was found to have favorable results in its relation to the aforementioned effects (of ginger), as well as hepatoprotective, anti-hyperlipidemic, and anti-ulcer effects.[25]

Mung bean

Positive results have been found within the phytochemistry of mung beans.[26,27] Antioxidative phytonutrients are believed to lower stress through neutralizing free radicals, thus the antioxidative stress effects of mung beans can lead to decreased cases of inflammation, diabetes, and hypertension.

Grains (Whole grains, “Good grains”)

In a review of nine randomized controlled trials (RCTs) aiming to measure the consumption of whole grains and its relation to risk of CVD, or lower blood cholesterol, or blood pressure, insufficient evidence in the literature was found, meaning a recommendation could not be made.[28] In another review, twelve cohort studies were analyzed by looking to find an association between whole grain (thought to be good grains) intake and all-cause mortality.[29] A total of 768,076 participants and 97,876 deaths led to a conclusion that whole grain breads, breakfast cereals, and pasta were inversely associated with all-cause mortality. There was a strong significant inverse association with CVD mortality.

Green Banana (Unripe Plantain)

In a review of 18 studies on green bananas, increased satiety, glucose homeostasis, a reduction in body weight and increased insulin sensitivity was found in correlation with

consumption of either green banana flour (10 studies) or green banana pulp/biomass (8 studies).[30]

Fruit

Wang et al.[31] provided further evidence of the recommendations of fruit consumption with regards to all-cause mortality in a review that analyzed seven studies comprising 553,698 total participants and 42,219 cases. The reduction in total mortality was significant as the number of servings increased, until five servings, after which the risk did not reduce further. The risk of cardiovascular mortality was decreased by 5% for fruit, however a lower risk of mortality from cancer was not found.

3.2.2. Tamasic and rajasic foods

Oil (Olive, Sesame, Palm, Mustard)

A randomized controlled clinical trial on olive oil intake (n = 7,216) took data from the PREvención con DIeta MEDiterránea (PREDIMED) study.[32] The results showed a 22% lower risk of all-cause mortality for those with a high (56.9 ± 10.8 g/day) olive oil intake versus those in the reference group (21.4 ± 8.00 g/day). Saturated fatty acids have been suggested to increase cardiovascular risk.[33] However, de Souza et al.[34] found no association with cardiovascular mortality in the cases of CVD or CHD. Additionally, no significant association was found with saturated fatty acid intake and all-cause mortality. Palm oil, a food high in saturated fats, has been suggested to need further evidence in order to make a recommendation for palm oil consumption.[35]A study on sesame oil consumption in 30 hypertensive males (mean age 52.7 ± 10.4 years) had 17 of the males consume 35g of sesame oil each day as an alternative oil to be used in their salad.[36] This study compared the use of sesame oil against the use of other oils, rather than against a placebo control group due to the wide use of oils in the average population's diet (mainly corn and olive oil) and showed that in the group in which the 35g of sesame oil was consumed daily, increased fibromuscular dysplasia (FMD) was shown acutely. Increased FMD was shown alongside decreased endothelial function after chronic consumption. One study surveyed 137 North Indian people aged between 40-80 years and found a positive correlation between CHD and mustard oil.[37]

Alcohol (Incl. Wine)

A study (2017) by Xi et al.[38] (333,247 participants, 34,754 all-cause deaths) suggested light to moderate drinking may have a negative association with CVD risk. The American College of Cardiology published an editorial further advocating for the results.[39] Both papers stayed consistent with the literature that binge drinking is associated with increased risk of cancer mortality (22%) and all-cause mortality (13%). Zhao et al.[40] provided a meta-analysis of 45 studies (n = 2,913,140 with 65,476 deaths available for analysis) that did not show statistical significance for low-moderate drinking in younger cohorts. Significantly reduced CHD risk was

observed in ages 55 and older in white populations, however this was not found in Asian populations. This enforces skepticism about the cardio-protective benefits of alcohol use stated in other reviews.[41] Results from the Study on Nutrition and Cardiovascular Risk in Spain found slightly conflicting results with the Xi et al. study as well. While heavy drinking was still shown to have a statistically significant positive association with higher death risk when compared to non-drinkers, no statistically significant benefit was found on mortality of light-moderate drinkers, even among people above ages 55.[42]

As far as wine, the Mediterranean diet, which includes moderate consumption of wine, has been shown to be associated with a lower incidence of all-cause mortality.[43] However, this is believed to be due to the high content of monounsaturated fatty acids (i.e. oleic acid in olive oil) and increased quantity of antioxidants, as part of the entire nutritional adequacy that the diet provides. Moderate wine intake (1-2 glasses per day) has been shown to be inversely associated with CVD and metabolic syndrome risk, but non-drinkers are not being suggested to initiate wine consumption.[44,45] A review on risk of development of cancer and wine consumption found no significant relation and suggests further evidence is needed.[46]

An active lifestyle is assumed to have been common at the time that the vedic texts were created, so the importance of physical activity may have been significant in the attenuation of alcohol consumption and its relation to mortality risk. A British population study (n = 297,988) that used individuals with a high level of physical activity and have never been a regular drinker showed decreased risk for those who drank within guidelines of <14 UK units of alcohol/week and had either a moderate or high level of physical activity; however, the results are not statistically significant.[47] The importance of using a UK unit of alcohol has been shown in a study demonstrating the increase in alcohol content when measuring a glass of wine over 25 years.[48] The highest decrease in risk was with those with a moderate physical activity and having never been a drinker. Those who were previous drinkers, and those who drank double the guidelines or more showed significant cardiovascular mortality risk for all physical activity levels. These results suggest an avoidance of alcohol consumption in large quantities.

The use of “former drinker” as a category being combined with non-drinkers has been shown to be a bias in skewing health risk estimates downwards, as shown in a study demonstrating the significant dose-response relationship between alcohol intake and risk of prostate cancer, even in low volume consumption groups.[49] Additionally, reducing alcohol use has been suggested to be an effective dementia prevention strategy and may play a role in suicide prevention.[50,51]

Fish

Zhang et al.[52] showed a negative association with fish consumption and CHD mortality in a meta-analysis of 25 studies. An increase of fish intake by 20 g/day was shown to be associated with a 4% reduction in both CHD incidence and mortality in the dose-response analysis. The

majority of data was collected from male groups and Western countries, suggesting further research on female groups and non-Western countries. In an elderly Japanese population study (n = 1133, 422 deaths) no significant association was found in regards to fish consumption and mortality.[53]A pattern was found in Indonesia showing a slight positive correlation with pre-hypertension and fish consumption in a small (n = 154) population study.[54] In the PREDIMED study, consuming eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (absorbed as part of fish consumption) were shown to have significant associations with a decrease in fatal CVD and CHD.[55] This association with CVD has been stated in another study on data of Swedish middle-aged and elderly men and women.[56] The study also found an association between dietary polychlorinated biphenyls (PCB) and CVD mortality risk in that the increased intake of PCB from fish led to increased risk of CVD mortality. Additionally, the Mediterranean diet is characterized by high fish consumption.[57]

Meat (Flesh, Red Meat, Processed Meat)

In a meta-analysis of cohort studies, 5 studies were analyzed in regards to processed meat and total mortality; 7 studies were analyzed for red meat and total mortality.[58] The results from the 5 studies showed significant association with increased all-cause mortality risk (22%) as well as CVD risk (18%) when compared to the lowest category of consumption. The analysis of red meat resulted in an association being shown with increased CVD risk, but not all-cause mortality risk. Both analyses showed significant heterogeneity, which could indicate further research being needed. A study on a population in Tanzania showed a significant association between hyperlipidemia and red meat consumption.[59]A study on middle-class Spanish graduate students found no statistically significant associations with meat consumption and type 2 diabetes mellitus (T2DM) within the 95% confidence interval used.[60] However, this population had an initial low average body weight, which may play a role in no statistically significant association being made, as visceral obesity has been shown to lead to insulin resistance.[61] Additionally, the Mediterranean diet is characterized by low meat consumption.[57]

Curd

Possible health effects have been shown such as an inverse association with curd or milk intake and eclampsia or preeclampsia in pregnant women in India.[62]

Horse Gram

Horse gram has been cited to be beneficial for a variety of ailments, but no association with mortality has been made.[63]

Garlic

In a discussion of two randomized double-blind placebo-controlled studies, garlic was shown to have a blood pressure lowering effect, but its association with mortality requires further

studies.[64] In a Chinese elderly population based cohort study (n = 27,437), those who consumed garlic often (≥5 times/week) had an 11% decrease in risk of mortality when compared with those who consumed garlic rarely (<1 time/week). An inverse association was found with consumption of garlic and all-cause mortality.[65] Antioxidant, anti-inflammatory, hypolipidemic, activities and anticancer, cardioprotective, antihyperglycemic, antimicrobial, and antihypertensive effects of garlic have been well documented but require further study.[66]

Whey

In a review on dairy and dairy derivatives (whey and casein), there was no significant association between consumption and human gut microbiota composition.[67]

Masur Beans (Legumes, Lentils)

In another study using data from the PREDIMED trial, no statistically significant association was found with legume consumption and CVD or cancer mortality as a population.[68] Significant associations were found in stratified data; males, diabetic subjects, and obese subjects showed a negative association between total legume (incl. lentils) consumption and cancer mortality.

Pandu Fruit (*Syzygium cumini)*

Pandu fruit has been shown to stimulate insulin secretion of pancreatic beta cells, demonstrating anti-diabetic properties.[69]

Gourds

A gourd and root diet (containing bitter gourd (*Momordica charantia*), bottle gourd, ridge gourd, snake gourd, radishes, pumpkin, sweet potato, spinach) was not found to have any significant association with CVD, CHD, or cerebrovascular disease.[70]Additionally, bitter gourd has been thought to have anti-diabetic, anti-viral, anti-bacterial, and anti-cancer properties, and ivy gourd has been thought to have anti-diabetic effects.[71] However, bitter gourd contains toxic cucurbitacins and its consumption may lead to possible symptoms such as nausea, diarrhea, vomiting, intestinal bleeding and discomfort.[72]

Berries

Berry anthocyanin intake has been shown to lead to improvements in arterial stiffness and blood pressure.[73] Participants of the Kuopio Ischaemic Heart Disease Risk Factor (KIHD) study were analyzed to determine risk factors for CVD and atherosclerosis within the randomly selected Finnish male population (*n* = 2,641). Significant dose-response associations were found between fruit/berry/vegetable intake and a decrease of all-cause mortality as well as CVD-related mortality.[74]

Bael Fruit (Kanta-bilva, *Aegle marmelos*)

Bael fruit has been shown to suppress tumor growth in rats with DMBA (7,12-Dimethylbenz[a]anthracene) induced breast cancer.[75]

Kadamba (*Nauclea cadamba*)

Antioxidant, antivenom, antihelminthic, antifungal, antifilarial, antibacterial, antidiabetic, antitumor, anti-inflammatory, hypolipidemic, antihepatotoxic, and diuretic activities/effects have been linked to Kadamba, but further evidence is needed.[76]

Bimba (*Coccinia grandis,* ivy gourd)

Coccinia grandis is believed to be an insulin mimetic; in a double-blind phase 1 clinical trial, a salad of Coccinia grandis was tested against a placebo in which the results showed a significant reduction in postprandial glucose values at the 1 and 2 hour mark.[77] Other hypoglycemic properties have been documented.[71]

Lukucha (Monkey Fruit, *Artocarpus lacucha*)

Antinociceptive properties have been found in Artocarpus lacucha, as well as slight anthelmintic, mild antioxidant, and anti-inflammatory properties.[78,79]

Onion

Onion consumption has been found to have no statistically significant association with risk of all-cause mortality, but was shown to have possible inverse associations with cancer mortality and CVD mortality with wide confidence intervals, suggesting more data is needed.[80]

Lotus (*Nelumbo nucifera*)

Hypolipidemic and cancer inhibitory effects have been shown to be present in lotus leaves.[81,82]

Kamaranga (Star Fruit, *Averrhoa carambola*)

Antihyperlipidemic and antioxidant effects have been shown in kamaranga.[83,84] Antihyperglycemic effects have been shown as well.[85] But an association with nephrolithiasis (kidney stones) and obstructive nephropathy (kidney disease) has also been made.[84,86]

Salmali (*Bombax ceiba*)

The possible benefits of kamaranga are shared with salmali along with hepatoprotective activities.[87,88,89]

Kemuka (Crepe ginger, *Cheilocostus speciosus*)

Medagama et al.[71] provide evidence that kemuka (crepe ginger) may have a hypoglycemic effect, as well as improve dyslipidemia.

4. Conclusion

Summary of evidence

Eighty-two papers were cited in the synthesis and discussion of this review.[8-89] Of these, 18 were published over 5 years (< 2015) ago.[9,22,24,26,32,36,43,58,61,62,64,70-72,74,77,85,89] No studies were published longer than 10 (< 2010) years ago. *Appendix A* outlines the number of papers used, and mortality association and/or health benefit/risk of each item included in the review. For items not included in the review, a note was made for reasoning—either "Lack of evidence" or "Broad categorization". For the former (lack of evidence), no papers were found to be usable after all three passes in the selection process. For the latter (broad categorization), it was found impossible to accurately define the foods consisting the broad categorizations mentioned in the texts.

The totality of evidence points to inverse associations between whole grains, fruits, olive oil, fish, garlic, berries (when consumed as part of a diet with vegetables and fruits) and either CVD, cancer, CHD, or all-cause mortalities. Specifically for all-cause mortality, possible inverse associations were found with whole grains,[29] fruit,[31] olive oil,[32] garlic,[65] berries when consumed along with fruits and vegetables,[74] and wine in the Mediterranean population.[43] No association was found between all-cause mortality and red meat,[58] and onions.[80] A positive association was found between all-cause mortality and sugar,[21] alcohol,[38-40] and processed meat.[58] Many health benefits are provided for many foods that are considered both sattvic, rajasic, or tamasic in *Appendix A*. There is not enough evidence to determine if there is a significant association between a sattvic diet as presented in this review and all-cause mortality. Further evidence is required on the constituents of a sattvic diet in relation to mortality to determine any association; recommendations should only be used with caution given.

Limitations

The search process did not involve articles older than 10 years, articles behind paywalls, and did not find articles in other languages.

Conflicts of interest

The author declares no conflict of interest.

REFERENCES

1. Prabhupada A.C. Bhaktivedanta Swami. *Bhagavad-gita As It Is*. Marina del Rey, CA: Krishna Books; 2014.

2. Saraswati M, Saraswati S, Svatmarama. *Hatha Yoga Pradipika: Light on Hatha Yoga: Including the Original Sanskrit Text of the Hatha Yoga Pradipika with Translation in English*. Munger, Bihar, India: Yoga Publications Trust; 2012.
3. Vasu SC. *Gheranda Samhita Sanskrit - English*. Shakti Nagar, Delhi: Sri Satguru Publications; 1979.
4. Joshi K. *112 Upaniṣads: (an Exhaustive Introduction, Sanskrit Text, English Translation and Index of Verses)*. Delhi: Parimal Publications; 2013.
5. Ventola CL. Current Issues Regarding Complementary and Alternative Medicine (CAM) in the United States: Part 1: The Widespread Use of CAM and the Need for Better-Informed Health Care Professionals to Provide Patient Counseling. *P T* 2010;35(8):461-468.
6. Fischer, F.H., Lewith, G., Witt, C.M. et al. High prevalence but limited evidence in complementary and alternative medicine: guidelines for future research. *BMC Complement Altern Med* 14, 46 (2014). https://doi.org/10.1186/1472-6882-14-46
7. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G. PRISMA Group Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 2009, 6, e1000097.
8. Jayedi A, Soltani S, Zargar M, Khan T, Shab-Bidar S. Central fatness and risk of all cause mortality: systematic review and dose-response meta-analysis of 72 prospective cohort studies. *BMJ* (Clinical research ed). 2020;370:m3324.
9. Willcox BJ, Willcox DC. Caloric restriction, caloric restriction mimetics, and healthy aging in Okinawa: controversies and clinical implications: Controversies and clinical implications. *Curr Opin Clin Nutr Metab Care* 2014;17(1):51-58.
10. Perman MI, Ciapponi A, Franco JV, Loudet C, Crivelli A, Garrote V, et al. Prescribed hypo - caloric nutrition support for critically-ill adults. *Cochrane Database Syst Rev* 2018;6:CD007867.
11. Chen H-J, Wang Y, Cheskin LJ. Relationship between frequency of eating and cardiovascular disease mortality in U.S. adults: the NHANES III follow-up study. *Ann Epidemiol* 2016;26(8):527-533.
12. Kock N. Wheat flour versus rice consumption and vascular diseases: Evidence from the China Study II data. *Cliodynamics J Quant Hist Cult Evol* 2015;6(2). doi:10.21237/c7clio6227969
13. Izadi V, Azadbakht L. Is there any association between rice consumption and some of the cardiovascular diseases risk factors? A systematic review. *ARYA Atheroscler* 2015;11(Suppl 1):109-115.
14. Saneei P, Larijani B, Esmaillzadeh A. Rice consumption, incidence of chronic diseases and risk of mortality: meta-analysis of cohort studies. *Public Health Nutr* 2017;20(2):233-244.
15. Kim Y, Je Y. Dietary fibre intake and mortality from cardiovascular disease and all cancers: A meta-analysis of prospective cohort studies. *Arch Cardiovasc Dis* 2016;109(1):39-54.
16. López-Plaza B, Bermejo LM, Santurino C, Cavero-Redondo I, Álvarez-Bueno C, Gómez-Candela C. Milk and dairy product consumption and prostate cancer risk and mortality: An overview of Systematic Reviews and meta-analyses. *Adv Nutr* 2019;10(suppl_2):S212-S223.

17. Cavero-Redondo I, Alvarez-Bueno C, Sotos-Prieto M, Gil A, Martinez-Vizcaino V, Ruiz JR. Milk and dairy product consumption and risk of mortality: An overview of systematic reviews and meta-analyses. *Adv Nutr* 2019;10(suppl_2):S97-S104.
18. Thorning TK, Raben A, Tholstrup T, Soedamah-Muthu SS, Givens I, Astrup A. Milk and dairy products: good or bad for human health? An assessment of the totality of scientific evidence. *Food Nutr Res* 2016;60(1):32527.
19. Jin S, Kim Y, Je Y. Dairy consumption and risks of colorectal cancer incidence and mortality: A meta-analysis of prospective cohort studies. *Cancer Epidemiol Biomarkers Prev* Published online 2020. doi:10.1158/1055-9965.EPI-20-0127
20. Storhaug CL, Fosse SK, Fadnes LT. Country, regional, and global estimates for lactose malabsorption in adults: a systematic review and meta-analysis. *Lancet Gastroenterol Hepatol* 2017;2(10):738-746.
21. Schwingshackl L, Schwedhelm C, Hoffmann G, et al. Food groups and risk of all-cause mortality: a systematic review and meta-analysis of prospective studies. *Am J Clin Nutr* 2017;105(6):1462-1473.
22. Tasevska N, Park Y, Jiao L, Hollenbeck A, Subar AF, Potischman N. Sugars and risk of mortality in the NIH-AARP Diet and Health Study. *Am J Clin Nutr* 2014;99(5):1077-1088.
23. Ramne S, Alves Dias J, González-Padilla E, et al. Association between added sugar intake and mortality is nonlinear and dependent on sugar source in 2 Swedish population-based prospective cohorts. *Am J Clin Nutr* 2019;109(2):411-423.
24. Mashhadi NS, Ghiasvand R, Askari G, Hariri M, Darvishi L, Mofid MR. Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. *Int J Prev Med* 2013;4(Suppl 1):S36-42.
25. Shendge PN, Belemkar S. Therapeutic potential of Luffa acutangula: A review on its traditional uses, phytochemistry, pharmacology and toxicological aspects. *Front Pharmacol* 2018;9:1177.
26. Tang D, Dong Y, Ren H, Li L, He C. A review of phytochemistry, metabolite changes, and medicinal uses of the common food mung bean and its sprouts (Vigna radiata). *Chem Cent J* 2014;8(1):4.
27. Ganesan K, Xu B. A critical review on phytochemical profile and health promoting effects of mung bean (Vigna radiata). *Food Sci Hum Wellness* 2018;7(1):11-33.
28. Kelly SA, Hartley L, Loveman E, et al. Whole grain cereals for the primary or secondary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2017;8:CD005051.
29. Zong G, Gao A, Hu FB, Sun Q. Whole grain intake and mortality from all causes, cardiovascular disease, and cancer: A meta-analysis of prospective cohort studies. *Circulation* 2016;133(24):2370-2380.
30. Falcomer AL, Riquette RFR, de Lima BR, Ginani VC, Zandonadi RP. Health benefits of green banana consumption: A systematic review. *Nutrients* 2019;11(6):1222.
31. Wang X, Ouyang Y, Liu J, et al. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ* 2014;349(jul29 3):g4490-g4490.
32. Guasch-Ferré M, Hu FB, Martínez-González MA, et al. Olive oil intake and risk of cardiovascular disease and mortality in the PREDIMED Study. *BMC Med* 2014;12(1):78.

33. Briggs MA, Petersen KS, Kris-Etherton PM. Saturated fatty acids and cardiovascular disease: Replacements for saturated fat to reduce cardiovascular risk. *Healthcare (Basel)* 2017;5(2):29.
34. de Souza RJ, Mente A, Maroleanu A, et al. Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *BMJ* 2015;351:h3978.
35. Ismail SR, Maarof SK, Siedar Ali S, Ali A. Systematic review of palm oil consumption and the risk of cardiovascular disease. *PLoS One* 2018;13(2):e0193533.
36. Karatzi K, Stamatelopoulos K, Lykka M, et al. Sesame oil consumption exerts a beneficial effect on endothelial function in hypertensive men. *Eur J Prev Cardiol* 2013;20(2):202-208.
37. Manna S, Sharma HB, Vyas S, Kumar J. Comparison of Mustard Oil and ghee consumption on the history of coronary Heart Disease in urban population of India. *J Clin Diagn Res* 2016;10(10):OC01-OC05.
38. Xi B, Veeranki SP, Zhao M, Ma C, Yan Y, Mi J. Relationship of alcohol consumption to all-cause, cardiovascular, and cancer-related mortality in U.s. adults. *J Am Coll Cardiol* 2017;70(8):913-922.
39. de Gaetano G, Costanzo S. Alcohol and health: Praise of the J curves. *J Am Coll Cardiol* 2017;70(8):923-925.
40. Zhao J, Stockwell T, Roemer A, Naimi T, Chikritzhs T. Alcohol consumption and mortality from coronary heart disease: an updated meta-analysis of cohort studies. *J Stud Alcohol Drugs* 2017; 78: 375–86.
41. Stockwell T, Zhao J, Panwar S, et al. Do "Moderate" Drinkers Have Reduced Mortality Risk? A Systematic Review and Meta-Analysis of Alcohol Consumption and All-Cause Mortality. *J Stud Alcohol Drugs* 2016; 77:185–198. [PubMed: 26997174]
42. Ortolá R, García-Esquinas E, López-García E, León-Muñoz LM, Banegas JR, Rodríguez-Artalejo F. Alcohol consumption and all-cause mortality in older adults in Spain: an analysis accounting for the main methodological issues. *Addiction* 2019;114(1):59-68.
43. Castro-Quezada I, Román-Viñas B, Serra-Majem L. The Mediterranean diet and nutritional adequacy: a review. *Nutrients* 2014;6(1):231-248.
44. Castaldo L, Narváez A, Izzo L, et al. Red Wine consumption and cardiovascular health. *Molecules* 2019;24(19):3626.
45. Pavlidou E, Mantzorou M, Fasoulas A, Tryfonos C, Petridis D, Giaginis C. Wine: An aspiring agent in promoting longevity and preventing chronic diseases. *Diseases* 2018;6(3). doi:10.3390/diseases6030073
46. Teissedre P-L, Rasines-Perea Z, Ruf J-C, et al. Effects of alcohol consumption in general, and wine in particular, on the risk of cancer development: a review. *OENO One* 2020;54(4):813-832.
47. Powell L, Feng Y, Duncan MJ, Hamer M, Stamatakis E. Does a physically active lifestyle attenuate the association between alcohol consumption and mortality risk? Findings from the UK biobank. *Prev Med* 2020;130(105901):105901.
48. Britton A, O'Neill D, Bell S. Underestimating the alcohol content of a glass of wine: The implications for estimates of mortality risk. *Alcohol* 2016;51(5):609-614.
49. Zhao J, Stockwell T, Roemer A, Chikritzhs T. Is alcohol consumption a risk factor for prostate cancer? A systematic review and meta-analysis. *BMC Cancer* 2016;16(1):845.

50. Rehm J, Hasan OSM, Black SE, Shield KD, Schwarzinger M. Alcohol use and dementia: a systematic scoping review. *Alzheimers Res Ther* 2019;11(1):1.
51. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol policies and suicide: A review of the literature. *Alcohol Clin Exp Res* 2016;40(10):2043-2055.
52. Zhang B, Xiong K, Cai J, Ma A. Fish consumption and coronary heart disease: A meta-analysis. *Nutrients* 2020;12(8):2278.
53. Otsuka R, Tange C, Nishita Y, et al. Fish and meat intake, serum eicosapentaenoic acid and docosahexaenoic acid levels, and mortality in community-dwelling Japanese older persons. *Int J Environ Res Public Health* 2019;16(10):1806.
54. Soleha U, Qomaruddin MB. Saltwater fish consumption pattern and incidence of hypertension in adults: A study on the population of Gresik coast, Indonesia. *J Public Health Res* 2020;9(2):1846.
55. Sala-Vila A, Guasch-Ferré M, Hu FB, et al. Dietary α-linolenic acid, marine ω-3 fatty acids, and mortality in a population with high fish consumption: Findings from the PREvención con DIeta MEDiterránea (PREDIMED) study. *J Am Heart Assoc* 2016;5(1). doi:10.1161/JAHA.115.002543
56. Donat-Vargas C, Bellavia A, Berglund M, Glynn A, Wolk A, Åkesson A. Cardiovascular and cancer mortality in relation to dietary polychlorinated biphenyls and marine polyunsaturated fatty acids: a nutritional-toxicological aspect of fish consumption. *J Intern Med* 2020;287(2):197-209.
57. Rees K, Takeda A, Martin N, et al. Mediterranean-style diet for the primary and secondary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2019;3:CD009825.
58. Abete I, Romaguera D, Vieira AR, Lopez de Munain A, Norat T. Association between total, processed, red and white meat consumption and all-cause, CVD and IHD mortality: a meta-analysis of cohort studies. *Br J Nutr* 2014;112(5):762-775.
59. Diarz EJ, Leyaro BJ, Kivuyo SL, et al. Red meat consumption and its association with hypertension and hyperlipidaemia among adult Maasai pastoralists of Ngorongoro Conservation Area, Tanzania. *PLoS One* 2020;15(6):e0233777.
60. Mari-Sanchis A, Gea A, Basterra-Gortari FJ, Martinez-Gonzalez MA, Beunza JJ, Bes-Rastrollo M. Meat consumption and risk of developing type 2 diabetes in the SUN Project: A highly educated middle-class population. *PLoS One* 2016;11(7):e0157990.
61. A. Hussain, M.Z.I. Hydrie, B. Claussen and S. Asghar, Type 2 Diabetes and obesity: A review, *Journal of Diabetology* 2010;2:1-7.
62. Agrawal S. Frequency of consumption of specific food items and symptoms of preeclampsia and eclampsia in Indian women. *Int J Med Public Health* 2014;4(4):350-353.
63. Bhartiya A, Aditya JP, Kant L. Nutritional and remedial potential of an underutilized food legume horsegram (*Macrotyloma uniflorum*): a review. *JAPS* 2015 25(4):908–920.
64. Stabler SN, Tejani AM, Huynh F, Fowkes C. Garlic for the prevention of cardiovascular morbidity and mortality in hypertensive patients. *Cochrane Database Syst Rev* 2012;(8):CD007653.
65. Shi X, Lv Y, Mao C, et al. Garlic consumption and all-cause mortality among Chinese oldest-old individuals: A population-based cohort study. *Nutrients* 2019;11(7):1504.

66. Ansary J, Forbes-Hernández TY, Gil E, et al. Potential health benefit of garlic based on human intervention studies: A brief overview. *Antioxidants (Basel)* 2020;9(7). doi:10.3390/antiox9070619
67. Aslam H, Marx W, Rocks T, et al. The effects of dairy and dairy derivatives on the gut microbiota: a systematic literature review. *Gut Microbes* 2020;12(1):1799533.
68. Papandreou C, Becerra-Tomás N, Bulló M, et al. Legume consumption and risk of all-cause, cardiovascular, and cancer mortality in the PREDIMED study. *Clin Nutr* 2019;38(1):348-356.
69. Zulcafli AS, Lim C, Ling AP, Chye S, Koh R. Antidiabetic potential of Syzygium sp.: An overview. *Yale J Biol Med* 2020;93(2):307-325.
70. Chen Y, McClintock TR, Segers S, et al. Prospective investigation of major dietary patterns and risk of cardiovascular mortality in Bangladesh. *Int J Cardiol* 2013;167(4):1495-1501.
71. Medagama AB, Bandara R. The use of complementary and alternative medicines (CAMs) in the treatment of diabetes mellitus: is continued use safe and effective? *Nutr J* 2014;13(1):102.
72. Indian Council of Medical Research Task Force. Assessment of effects on health due to consumption of bitter bottle gourd (Lagenaria siceraria) juice. *Indian J Med Res* 2012;135(1):49-55.
73. A. Cassidy. Berry anthocyanin intake and cardiovascular health. *Mol Aspects Med* 2018;61:76–82
74. Rissanen TH, Voutilainen S, Virtanen JK, et al. Low intake of fruits, berries and vegetables is associated with excess mortality in men: The Kuopio ischaemic heart disease risk factor (KIHD) study. *J Nutr*. 2003;133(1):199-204.
75. Akhouri V, Kumari M, Kumar A. Therapeutic effect of Aegle marmelos fruit extract against DMBA induced breast cancer in rats. *Sci Rep* 2020;10(18016) https://doi.org/10.1038/s41598-020-72935-2.
76. Dwevedi A, Sharma K, Sharma YK. Cadamba: A miraculous tree having enormous pharmacological implications. *Pharmacognosy Reviews*. 2015 Jul-Dec;9(18):107-113. DOI: 10.4103/0973-7847.162110.
77. Munasinghe MAAK, Abeysena C, Yaddehige IS, Vidanapathirana T, Piyumal KPB. Blood sugar lowering effect of Coccinia grandis (L.) J. Voigt: path for a new drug for diabetes mellitus. *Exp Diabetes Res* 2011;2011:978762.
78. Islam S, Shajib MS, Rashid RB, et al. Antinociceptive activities of Artocarpus lacucha Buch-ham (Moraceae) and its isolated phenolic compound, catechin, in mice. *BMC Complement Altern Med* 2019;19(1):214.
79. Uddin, M.G., Islam, M.M., Ahmed, A., Siddiqui, S.A., Debnath, A. 2020. Evaluation of anthelmintic, antioxidant and anti-inflammatory potential of methanolic extract of Artocarpus lacucha leaves. *Discovery Phytomedicine* 7(1): 27-32. DOI:10.15562/ phytomedicine.2019.115
80. Ivey KL, Jensen MK, Hodgson JM, Eliassen AH, Cassidy A, Rimm EB. Association of flavonoid-rich foods and flavonoids with risk of all-cause mortality. *Br J Nutr* 2017;117(10):1470-1477.
81. Jung M-A, Lee SY, Han SH, et al. Hypocholesterolemic effects of Curcuma longa L. With Nelumbo nucifera leaf in an in vitro model and a high cholesterol diet-induced hypercholesterolemic mouse model. *Animal Cells Syst (Seoul)* 2015;19(2):133-143.

82. Yang M-Y, Hung T-W, Wang C-J, Tseng T-H. Inhibitory effect of Nelumbo nucifera leaf extract on 2-acetylaminofluorene-induced hepatocarcinogenesis through enhancing antioxidative potential and alleviating inflammation in rats. *Antioxidants (Basel)* 2019;8(9). doi:10.3390/antiox8090329
83. Aladaileh SH, Saghir SAM, Murugesu K, et al. Antihyperlipidemic and antioxidant effects of Averrhoa carambola extract in high-fat diet-fed rats. *Biomedicines* 2019;7(3):72.
84. Muthu N, Lee SY, Phua KK, Bhore SJ. Nutritional, medicinal and toxicological attributes of star-fruits (Averrhoa carambola L.): A review. *Bioinformation* 2016;12(12):420-424.
85. Shahreen S, Banik J, Hafiz A, et al. Antihyperglycemic Activities of Leaves of Three Edible Fruit Plants (*Averrhoa carambola, Ficus hispida* and *Syzygium samarangense*) of Bangladesh. *Afr J Tradit Complement Altern Med* 2012;9(2):287-291.
86. Ajmal MS, Awosika-Olumo A, Raghavan R. Traditional medications mixed with ethylene glycol in a Nigerian patient on hemodialysis. *Cureus* 2020;12(2):e6950.
87. Arafa AF, Foda DS, Mahmoud AH, Metwally NS, Farrag ARH. Bombax ceiba flowers extract ameliorates hepatosteatosis induced by ethanol and relatively moderate fat diet in rats. *Toxicol Rep* 2019;6:401-408.
88. Lee D-S, Keo S, Cheng S-K, Oh H, Kim Y-C. Protective effects of Cambodian medicinal plants on tert-butyl hydroperoxide-induced hepatotoxicity via Nrf2-mediated heme oxygenase-1. *Mol Med Rep* 2017;15(1):451-459.
89. Gupta P, Goyal R, Chauhan Y, Sharma PL. Possible modulation of FAS and PTP-1B signaling in ameliorative potential of Bombax ceiba against high fat diet induced obesity. *BMC Complement Altern Med* 2013;13(1):281.

APPENDIX

Appendix A.

Food *Sattvic*	Source	Keyword	Usage in paper	# of papers used	Mortality association	Health benefits/risk	Reason if not included
Wheat	2(p141)	wheat	Y	1		PA: vascular diseases	
Rice	2(p141), 3(p40)	rice	Y	2	NA: CVD	PA: diabetes, metabolic syndrome	
Barley	2(p141), 3(p40)	barley	Y	1		IA: CVD, CHD, all cancers	
Milk	2(p141)	milk	Y	4		PA: prostate cancer; NA: CVD; IA: Hypertension, stroke	
Ghee	2(p141)	ghee	N				Lack of evidence
Brown sugar	2(p141)	brown sugar	Y	3	PA: all-cause		
Sugar candy (crystallized sugar)	2(p141)	sugar candy; crystallized sugar					
Honey	2(p141)	honey	N				Lack of evidence
Dry ginger	2(p141)	dry ginger; ginger	Y	1		Anti-inflammatory/cancer/diabetic/oxidant effects	
Patola fruit	2(p141)	patola; patola fruit; *Luffa acutangula*	Y	1		Anti-inflammatory/cancer/diabetic/oxidant/hyperlipidemic/ulcer, hepatoprotective effects	
Patola leaves	2(p141)	patola leaf; patola leaves; *Luffa acutangula*					
Green vegetables	2(p141)	green vegetables; vegetables	N				Broad categorization
Fresh vegetables	2(p141)	fresh vegetables; vegetables	N				Broad categorization
Black vegetables	2(p141)	black vegetables; vegetables	N				Broad categorization
Vastuku-saka	2(p141)	vastuku-saka; vastuku; saka	N				Lack of evidence
Hima-lochika saka	2(p141)	hima-lochika-saka; hima; lochika; saka	N				Lack of evidence
Mung beans	2(p141), 3(p40)	mung beans; beans	Y	2		Anti-inflammatory/oxidant/diabetic/hypertensive effects	
Grain	2(p141), 3(p40)	grain; grains	Y	2	IA: all-cause, CVD		
Wheaten bread	3(p40)	wheaten bread; bread	N				Lack of evidence
Jackfruit	3(p40)	jackfruit	N				Lack of evidence
Kakkola	3(p40)	kakkola	N				Lack of evidence

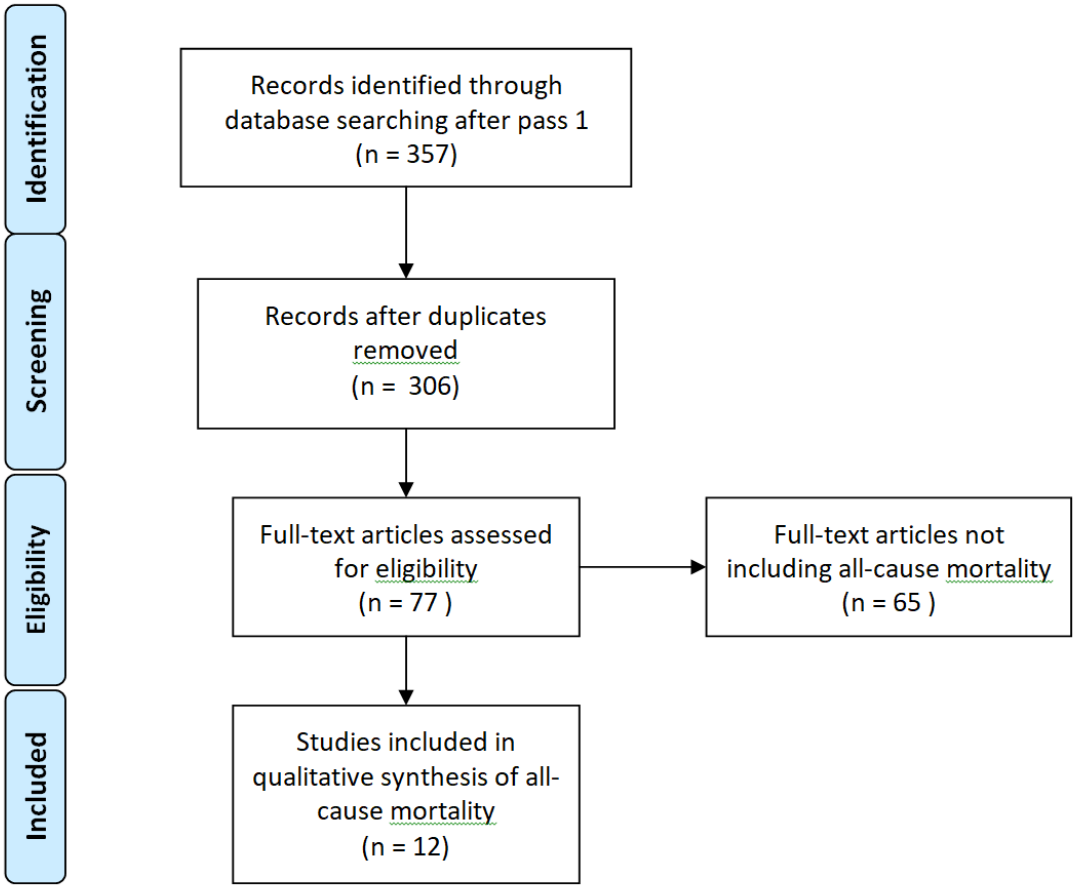
	Jujube	2(p141), 3(p40)	jujube	N			Lack of evidence
	Bonduc nut	3(p40)	bonduc nut	N			Lack of evidence
	Cucumber	3(p40)	cucumber	N			Lack of evidence
	Plantain	3(p40)	plantain	N			Lack of evidence
	Unripe plantain	3(p40)	plantain; unripe plantain	Y	1	Increased satiety/glucose homeostasis, increased insulin sensitivity	
	Small plantain	3(p40)	plantain; small plantain	N			Lack of evidence
	Plantain stem	3(p40)	plantain; plantain stem	N			Lack of evidence
	Plantain roots	3(p40)	plantain; plantain root; plantain roots	N			Lack of evidence
	Eggplant	3(p40)	eggplant	N			Lack of evidence
	Medicinal roots	3(p40)	medicinal roots; medicinal root	N			Broad categorization
	Fruits	3(p40)	fruit; fruits	Y	1	IA: all-cause, CVD; NA: cancer	
Tamasic/Rajasic							
	Green vegetables other than those ordained	2(p137)	green vegetables	N			Broad categorization
	Kanji	2(p137)	kanji; sour gruel	N			Lack of evidence
	Oil	2(p137)	oil	Y	4	olive—IA: all-cause; sat. fat—NA: all-cause, CVD, CHD	
	Sesame	2(p137)	sesame	Y (oil)	1	Increased FMD, decreased endothelial function	
	Mustard	2(p137)	mustard	Y (oil)	1	PA: CHD	
	Alcohol	2(p137)	alcohol; beer; liquor	Y	4	binge/heavy—mixed results: all-cause, cancer	light-moderate—IA: CVD, CHD; PA: dementia, suicide
	Wine	2(p137), 3(p40)	wine	Y	4		IA: CVD, metabolic syndrome; NA: cancer
	Fish	2(p137)	fish	Y	4	IA: CHD, CVD; NA: all-cause	IA: CVD, CHD
	Flesh	2(p137)	flesh; meat; red meat; white meat	Y	4	processed—PA: all-cause; red—NA: all-cause	NA: T2DM; red—PA: hyperlipidemia, CVD; processed—CVD;
	Curds	2(p137), 3(p40)	curd; curds; cheese	Y	1		IA: eclampsia/preeclampsia
	Buttermilk	2(p137)	buttermilk	N			Lack of evidence

Kulattha	3(p40)	horse gram; *Macrotyloma uniflorum*	Y	1		Anti-diabetic/ulcer activities	
Oil cakes	2(p137)	oil cakes; cakes; cake	N				Broad categorization
Asafetida	2(p137), 3(p40)	asafetida; hinga	N				Lack of evidence
Garlic	2(p137)	garlic	Y	3	IA: all-cause	Anti-oxidant/inflammatory/cancer/hyperglycemic/microbial/hypertensive and cardioprotective activities/effects	
Whey	3(p40)	whey	Y	1		NA: gut microbiota composition	
Heavy vegetables	2(p135), 3(p40)	heavy vegetables	N				Broad categorization
Palm nuts	3(p40)	palm nuts; palm	Y (oil)	1		NA: CVD	
Over-ripe jack-fruit	3(p40)	over-ripe/overripe/over ripe + jackfruit/jack-fruit/jack fruit	N				Lack of evidence
Masur beans	3(p40)	split red lentils; split orange lentils; split lentils; red lentils; orange lentils; lentils	Y (lentils)	1	NA: CVD, cancer; males/diabetic or obese subjects—IA: cancer		
Pandu fruit	3(p40)	pandu fruit; java plum; *Syzygium cumini*	Y	1		Anti-diabetic properties	
Pumpkin	3(p40)	pumpkin	N				Lack of evidence
Vegetable stems	3(p40)	vegetable stem; vegetable stems	N				Lack of evidence
Gourds	3(p40)	gourd; gourds	Y	3		NA: CVD, CHD, cerebrovascular disease; bitter gourd—anti-diabetic/viral/bacterial/cancer and toxic properties	
Berries	3(p40)	berry; berries	Y	2	IA (with veg/fruit intake): all-cause, CVD	Improvements in arterial stiffness, blood pressure	
Katha-bel	3(p40)	katha-bel; katha bel; wood apple; wood-apple; *Feronia elephantum*	N				Lack of evidence
Kanta-bilva	3(p40)	kanta-bilva; kanta bilva; bael; bael fruit; *Aegle marmelos*	Y	1		Breast cancer tumor growth suppression in rats	
Palasa	3(p40)	palasa; *Butea frondosa*	N				Lack of evidence
Kadamba	3(p40)	kadamba; *Nauclea cadamba*	Y	1		Anti-oxidant/venom/helminthic/fungal/filarial/bacterial/diabetic/tumor/inflam	
Jambira	3(p40)	jambira; citron	N				Lack of evidence
Bimba fruit	3(p40)	bimba; bimba fruit; ivy gourd; *Coccinia grandis*	Y	2		Hypoglycemic properties	
Lukucha	3(p40)	lukucha; monkey fruit; *Artocarpus lacucha*	Y	2		Anti-nociceptive/helminthic/oxidant/inflammatory properties	
Onion	3(p40)	onion	Y	1	NA: all-cause; IA: cancer, CVD		
Lotus	3(p40)	lotus; lotus root; *Nelumbo nucifera*	Y	2		Hypolipidemic, cancer inhibitory effects	

Kamaranga	3(p40)	kamaranga; star fruit; *Averrhoa carambola*	Y	5		Anti-hyperlipidemic/hyperglycemic/oxidant effects, PA: nephrolithiasis, obstructive nephropathy	
Piyala	3(p40)	piyala; chirauli nut; *Buchana latifolia*	N				Lack of evidence
Salmali	3(p40)	salmali; *Bombax ceiba*	Y	3		Anti-hyperlipidemic/hyperglycemic/oxidant effects, hepatoprotective activities	
Kemuka	3(p40)	kemuka; crepe ginger; *Cheilocostus speciosus*	Y	1		hypoglycemic effect, improved dyslipidemia	
Too many mixed vegetables	2(p138)	mixed vegetables	N				Broad categorization
Habit							
Eating too much/too little	2(p50, 60)	overeating; excess calories; obesity; caloric restriction	Y	3	central fatness—PA: all-cause; caloric restriction—IA: all-cause		
Eating more or less than twice daily	3(p41)	meal frequency	Y	1	IA: all-cause	IA: obesity	
Reheated food	2(p138)	reheated food; leftovers; old food	N	0			Lack of evidence

Key: NA = Negative Association, PA = Positive Association, IA = Inverse Association, CVD = Cardiovascular Disease, CHD = Congenital Heart Disease, FMD = Fibromuscular Dysplasia, T2DM = Type-II Diabetes Mellitus

Appendix B.



Adapted from PRISMA