REVIEW ARTICLE

Dietary approach to stop hypertension (DASH): diet components may be related to lower prevalence of different kinds of cancer: A review on the related documents

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Background: Dietary approaches to stop hypertension (DASH) eating plan is a healthy dietary pattern. Our object is to review surveys in the field of major components of DASH diet and different kinds of cancers. **Materials and Methods:** Our search result from PubMed search engine recruited to find related articles. **Results:** Adherence to the DASH diet components was significantly related to lower prevalence of various cancers due to their high content of fiber, nutrients, vitamins, mineral, and antioxidant capacity. **Conclusion:** In this review, positive association of DASH diet components and different cancers were observed. However, the exact association of DASH with cancers should be clarified in future longitudinal studies due to potential interaction among foods and nutrients.

Key words: Cancer, dietary approaches to stop hypertension, dietary approaches to stop hypertension eating pattern

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INTRODUCTION

The most previous studies have been conducted on the relationship between single nutrients, foods, food groups, and cancer risk. Researches in this field are valuable but according to consumption of various dietary groups together and their synergistic and antagonistic effects, evaluation of diet as a healthy dietary pattern can provide a more comprehensive dataset.[1-3] Several studies have been demonstrated advantageous influence of dietary approaches to stop hypertension (DASH) diet on cardiovascular disease, metabolic syndrome, diabetes, and mortality.[4-8] Beneficial influence of DASH diet through emphasis on reduction in salt intake and monitoring dietary fat intake on some cancers has been observed. Researchers are mainly focused on the association between DASH diet and colorectal and breast cancer.[9-12] More surveys require indicating the favorable effect of DASH diet in various cancers. Nevertheless, numerous studies have assessed the effect of DASH component in cancer prevention. In this review, we are going to assess the association between components of DASH diet and different kinds of cancers.

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MATERIALS AND METHODS

In order to investigate the association between DASH eating plan component and cancers, PubMed search engine was searched. Our keyword was DASH diet without any limitations.

RESULT

Articles included in our study are demonstrated in Figure 1 and Table 1.

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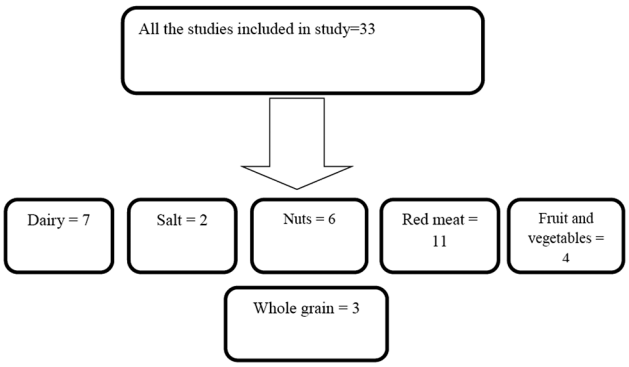

Figure 1: Flowchart of conducted studies in the field of dietary approaches to stop hypertension components

Dairy

Moderate intake of low-fat dairy is suggested by DASH diet. Several studies have assessed the effects of dairy products consumption on various cancers. Meta-analyses could not find supportive independent relationship between the intake of milk or dairy products and the risk of bladder and gastric cancers.[13,14]

Findings of the meta-analysis indicate that increased consumption of total dairy food, but not milk, may be associated with a reduced risk of breast cancer.[15] Meta-analyses carried out on prostate cancer did not strongly support increasing effect of various kinds of dairy products.[16,17] The effects of milk and total dairy products have been indicated in reduction of colorectal cancer risk.[18,19]

Salt

Salt intake is limited in DASH diet. In this regard, meta-analysis on salt intake and risk of various cancers has approved its rising effect significantly.[20,21]

Whole grain

Whole grains that replaced with refined grains in DASH diet recommended increasing in this dietary pattern. An expanded review and meta-analyses on various cancers and whole grain consumption supported the hypothesis of its preventive effect.[22-24]

Red meat

Many epidemiological and clinical trials have investigated the relationship between red meat and processed products and different cancers, but their findings are so inconsistent. Findings of a meta-analysis demonstrated high intake of processed meat may related to augmentation of bladder cancer risk (1.22; 95% CI: 1.04-1.43).[25] Increasing association of red and processed meat and lung cancer has been supported by meta-analysis of epidemiological studies.[26] Dose-response analysis indicated every increment of 100 g red meat per day increase stomach cancer risk 17%.[27] Also, esophageal cancer risk has been increased by high consumption of red and processed meat.[28] Meta-analysis suggested that every 50 g increase in processed meat consumption augments risk of pancreatic cancer 19%.[29]

Findings show every 100 g/day increase in red meat consumption, enhance risk of colorectal cancer by 14%.[30] On the other hand, other meta-analyses could not observe significant association between red meat intake and colorectal, ovarian, breast, and prostate cancers.[31,33-35] However, frequency of red meat consumption is mostly linked to colorectal cancer risk.[32]

Fruit and vegetable

Increase in fruits and vegetables consumption is recommended in DASH diet due to their fiber, antioxidants, vitamins, and minerals content. This hypothesis has been assessed in meta-analysis on bladder cancer that total fruit and vegetable indicate 17% reduction in cancer risk significantly.[36]

Meta-analysis has been demonstrated significant gastric cancer risk reduction only for fruits, but not vegetables.[37] Moreover, no significant protective effect observed for prostate cancer and fruit and vegetable consumption (vegetable: 0.97; 95% CI: 0.93, 1.01, and fruit: 1.02; 95% CI: 0.98, 1.07).[38] Meta-analysis on nasopharyngeal cancer and fruits and vegetables intake support positively risk reduction.[39]

Nuts

High consumption of nuts and seeds appears to be appropriate for cancer prevention. Epidemiologic studies observed a protective association between the increment in nut consumption and decrement in colorectal cancer, especially in women.[40-42] In addition, a large body of data presented that higher consumption of nuts and seeds decrease risk of prostate cancer and mortality.[43,44]

Regards to debates that breast cancer prevention should be started in adolescence, epidemiologic surveys shown that fiber and nuts intake during adolescence might protect against breast cancer in older ages.[45]

DISCUSSION

The evidence from studies approved protective effect of DASH diet components in most of the various cancers. All studies regarding dairy products were meta-analyses that summarized results of papers in that field. The effect of dairy products on cancer prevention refers to its ingredients such as calcium, lactoferrin, fat component, and its bacterial effect. Conjugated linoleic acid is one of the positive health effective parameters of dairy products.[46] Lactic acid bacteria in fermented dairy products can inhibit from

Table 1: Studies examined association of DASH diet component and various cancers

Study	Type of study	Number/sex	Design and aim	Results
Li *et al.*[13]	Meta-analysis	20 studies involving 324,241 individuals	Milk and dairy consumption and risk of bladder cancer	Nonsignificant relationship between milk and dairy consumption and risk of bladder cancer
Sun *et al.*[14]	Meta-analysis	39 articles, 837, 072 subjects	Dairy product consumption and GC risk	Dairy product consumption was associated with a nonsignificantly increased risk of GC
Dong *et al.*[15]	Meta-analysis	18 studies involving 1,063,471 individuals	Dairy consumption and risk of breast cancer	Increased consumption of total dairy food, but not milk, may be associated with a reduced risk of breast cancer
Huncharek *et al.*[16]	Meta-analysis	45 observational studies, 26,769 cases	Dairy products, dietary calcium and vitamin D intake as risk factor for prostate cancer	Do not support an association between dairy product use and an increased risk of prostate cancer
Aune *et al.*[17]	Systematic review and meta-analysis	32 cohort	Dairy products, calcium, and prostate cancer risk	High intakes of dairy products, milk, low-fat milk, cheese, and total dietary, and dairy calcium, but not supplemental or nondairy calcium, may increase total prostate cancer risk
Aune *et al.*[18]	Meta-analysis	19 cohort studies	Dairy products and CRC risk	Milk and total dairy products, but not cheese or other dairy products, are associated with a reduction in CRC risk
Huncharek *et al.*[19]	Meta-analysis	60 observational studies, 26,335 cases	CRC risk and dietary intake of calcium, vitamin D, and dairy products	Higher consumption of milk/dairy products reduces the risk of colon cancer, and high calcium intake reduces the risk of CRC
D'Elia *et al.*[20]	Meta-analysis	7 studies involving 268, 718 individuals	Habitual salt intake and risk of GC	Dietary salt intake was directly associated with risk of GC
Hu *et al.*[21]	Case-control	19,732 patients and 5039 control	Salt, processed meat, and the risk of cancer	High consumption of salt and processed meat may play a role in the etiology of several cancers
Aune *et al.*[22]	Systematic review and meta-analysis	25 prospective studies, 1.9 million participants	Dietary fiber, whole grains, and risk of CRC	A high intake of dietary fiber, in particular cereal fiber and whole grains, was associated with a reduced risk of CRC
Haas *et al.*[23]	Meta-analysis	11 cohort studies, 1, 719, 590 participants	Effectiveness of whole grain consumption in the prevention of CRC	Consumption of whole grains was inversely associated with the risk of developing CRC
Jacobs *et al.*[24]	Meta-analysis	40 case-control studies	Whole-grain intake and cancer	Support the hypothesis that whole-grain intake protects against various cancers
Li *et al.*[25]	Meta-analysis	25 studies, 1, 558, 848 individuals	Red and processed meat intake and risk of bladder cancer	High consumption of processed meat probably correlated with rising risk of bladder cancer
Xue *et al.*[26]	Meta-analysis	33 observed studies	Red and processed meat consumption and the risk of lung cancer	Both red and processed meat consumption showed a positive effect on lung cancer risk
Song *et al.*[27]	Meta-analysis	18 studies involving 1,228,327 subjects	Red meat consumption and stomach cancer risk	Increased intake of red meat might be a risk factor for stomach cancer
Choi *et al.*[28]	Meta-analysis	27 studies, 1, 176, 331 participants	Consumption of red and processed meat and esophageal cancer risk	A higher consumption of red meat was associated with a greater risk of esophageal cancer
Larsson and Wolk[29]	Meta-analysis	13 prospective studies, 2, 307, 787 participants	Red and processed meat consumption and risk of pancreatic cancer	Processed meat consumption is positively associated with pancreatic cancer risk. Red meat consumption was associated with an increased risk of pancreatic cancer in men
Chan *et al.*[30]	Meta-analysis	24 prospective studies	Red and processed meat and CRC incidence	High intake of red and processed meat is associated with significant increased risk of colorectal, colon and rectal cancers
Alexander *et al.*[31]	Meta-analysis	34 prospective studies	Red meat consumption and CRC	Data are not sufficient to support an independent and unequivocal positive association between red meat intake and CRC

(Continued)

Table 1: (Continued)

Study	Type of study	Number/sex	Design and aim	Results
Smolinska and Paluszkiewicz[32]	Systematic review and meta-analysis	22 studies	Risk of CRC in relation to frequency and total amount of red meat consumption	Red meat intake is associated with elevated risk of developing CRC
Wallin *et al.*[33]	Meta-analysis	8 cohort studies, 754, 836 participants	Red and processed meat consumption and risk of ovarian cancer	Red and processed meat consumption is not associated with risk of ovarian cancer
Alexander *et al.*[34]	Review and meta-analysis	18 cohort studies	Red and processed meat consumption and breast cancer	The results of this meta-analysis do not appear to support an independent association between red meat or processed meat intake and breast cancer
Alexander *et al.*[35]	Meta-analysis	15 studies of red meat and 11 studies of processed meat	Red and processed meat intake and prostate cancer	Not supportive of an independent positive association between red or processed meat intake and prostate cancer
Yao *et al.*[36]	Meta-analysis	31 studies involving 1,121,649 individuals	Intake of fruit and vegetables and risk of bladder cancer	Intakes of fruit and vegetables may reduce the risk of bladder cancer
Wang *et al.*[37]	Meta-analysis	17 articles, >2.4 million individuals	Consumption of fruit, but not vegetables, may reduce risk of GC	A significant protective effect for the consumption of fruit on GC risk, but not for the consumption of vegetables
Meng *et al.*[38]	Meta-analysis	16 cohort studies	Fruit and vegetable intake and prostate cancer risk	Total fruit or vegetable consumption may not exert a protective role in the risk of prostate cancer
Jin *et al.*[39]	Meta-analysis	15 articles	Association of fruit and vegetables with the risk of NPC	Intake of vegetables and fruit may have a protective effect on NPC
Jenab *et al.*[40]	Cohort	478,040 subjects (141, 988 men, 336, 052 women)	Association of nut and seed intake with CRC risk	No association between higher intake of nuts and seeds and risk of colorectal, colon, and rectal cancers in men and women combined, but a significant inverse association was observed in subgroup analyses for colon cancer in women at the highest category
Yeh *et al.*[41]	Cohort	12,026 men and 11, 917 women	Peanut consumption and reduced risk of CRC in women	Frequent intake of peanut and its products may reduce CRC risk in women, demonstrating the anti-proliferating effect of peanut intake
Cotterchio *et al.*[42]	Case-control study	1095 cases, 1890 controls	Dietary phytoestrogen intake is associated with reduced CRC risk	Phytoestrogen intake may reduce CRC risk is important, because dietary intake is potentially modifiable
Jain *et al.*[43]	Case-control study	617 cases and 636 controls	Plant foods, antioxidants, and prostate cancer risk	Exposure to certain dietary components of plant origin, which are potentially modifiable, indicates the theoretical scope for reducing the risk from prostate cancer
Hebert *et al.*[44]	A cross-national study	-	Nutritional and socioeconomic factors in relation to prostate cancer mortality	Grains, cereals, and nuts are protective against prostate cancer
Su *et al.*[45]	Cohort	682 proliferative BBD cases	Intake of fiber and nuts during adolescence and incidence of proliferative benign breast disease	Dietary intake of fiber and nuts during adolescence influences subsequent risk of breast disease and may suggest a viable means for breast cancer prevention

DASH = Dietary approaches to stop hypertension; CRC = Colorectal cancer; GC = Gastric cancer; NPC = Nasopharyngeal cancer

Helicobacter pylori growth and its invasion and inflammation thus prevent from gastric cancer.[47,48] Another important component especially in colorectal cancer prevention is calcium with several hypothetical mechanisms.[49-51] Salt intake is a component of DASH diet which considered greatly in this healthy dietary pattern.

The potential mechanism could be alteration in mucus viscosity of stomach[52] and increment in *H. pylori* colonization.[53] Therefore, it causes mucosal injury that result in augmentation of cell proliferation in stomach mucosa.[54,55]

High consumption of whole grains is usually suggested due to beneficial effect of several components such as dietary fibers, antioxidants, vitamins, trace minerals, phytate, phenolic acids, lignans, and phytoestrogens.[42,56,57] Dietary fiber is one of the most important ingredients in colorectal cancer prevention because it can enhance stool bulk, attenuating fecal carcinogens, and decline transit time so decrease contact between carcinogens and colorectal cells.[58] Moreover, bacterial activation in colon results in fiber fermentation and short chain fatty acid output that is effective in cancer inhibition.[56]

High red meat consumers are at risk of different cancers more than low consumers. Modification of dietary pattern and lifestyle should be a priory to prevent of cancers and reduce burden of disease. The effect of red and processed meat in incidence of cancers connected to preservation, cooking or processing that could produce mutagens and carcinogens including N-Nitroso compounds (NOCs), heterocyclic amines, and polycyclic aromatic hydrocarbons.[59-64] Furthermore, high heme iron content of meat, especially red meat, could provide free radicals[65] such as stimulation of endogenous NOC production,[66] and also iron is crucial growth factor for *H. pylori*.[67] Saturated fatty acids (SFAs) are another component that may be related to cause of cancer.[65,68]

Beneficial effects of fruit and vegetables have been investigated in some cancers. Multiple components of fruits and vegetables such as beta-carotene, fiber, vitamins, alpha-tocopherol, retinoids, phytoestrogens and folate can cause their protective effect against cancers[69] through potent mechanism such as prohibition of cell growth, normalize DNA synthesis and methylation, and protection against DNA damage and oxidative stress.

Sulforaphane is an isothiocyanate component found in vegetables such as cruciferous vegetables which its protective effect is considered greatly in new epidemiological studies.[70-74]

Nuts are extremely valuable nutritionally due to wide range of nutrients such as proteins, unsaturated fatty acids, vitamins (B6, niacin, folic acid, tocopherol), dietary fiber, copper, magnesium, potassium, zinc, antioxidants (i.e., resveratrol, ellagic acid, and several flavonoids), phytoestrogens, and many phytochemicals (i.e., anacardic acid). Most of these components play important role in cancer prevention through prohibition of cancer cell proliferation, decrease metastasis, inducing cancer cell death and intervention in some other pathways related to cancer cell growth.

This review create new ideas and attract researchers to conduct more surveys in the field of DASH diet because its superior effect to other patterns including emphasis on the amount of salt intake, and restriction in intake of total fat. A limitation was lack of discussion about quality of articles due to different cancer categories of articles. Nevertheless, efforts in our review with covering the major component of DASH diet were to assess their relationship with cancers comprehensively.

CONCLUSION

There are limited investigations regarding the association of DASH eating plan and the risk of different cancers. Although many studies have assessed the association of its component with different cancers, due to potential interaction among foods and nutrients, the exact association of DASH with cancers should be clarified in future longitudinal studies.

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Conflicts of interest

There are no conflicts of interest.

AUTHOR'S CONTRIBUTION

SHO contributed in the conception of the work, drafting the manuscript, FH contributed in the conception of the work, conducting the study, drafting and revising the draft, LA contributed in the conception of the work, conducting the study, revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work.

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