Mediterranean Diet and Reducing the Risk of Cancer: A Literature Review

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ABSTRACT

Background: The traditional Mediterranean Diet (MD) is thought to be associated with a reduced risk of different types of health issues, including cancer. However, the research varies from study to study. **Purpose:** The intent of this paper is to review the components which make up the traditional MD and discuss the findings of several European studies which target the effectiveness of the MD in reducing the risk of cancer in adults. **Method:** This literature review is comprised of meta-analyses, cohort studies, and case-control studies published from 2016 to 2018. **Findings:** Each study evaluated the effectiveness of the MD in relationship to the risk of cancer. Dependent upon the type and location of cancer, the findings varied. With pancreatic and lung cancers, it was determined there was insufficient evidence to support an inverse relationship with the MD. However, a reduced risk of cancer was reported with adherence to the MD in the studies reviewing nasopharyngeal, endometrial, and breast cancers. In adults, adherence to the MD did not decrease the risk of pancreatic or lung cancers but was found to reduce the risk of nasopharyngeal, endometrial and breast cancers. **Conclusion:** Evidence collected in these studies can be used by medical staff, including nurses, in educating the adult population of the efficacy of reducing different types of cancer by adhering to the MD.

INTRODUCTION

The American Cancer Society [1] estimates that 1.7 million Americans will be newly diagnosed with cancer in the following year. Unfortunately, this number does not include common cancers like basal cell or squamous cell skin cancers so the total number diagnosed is higher. Additionally, the ACA [1] estimates the United States will lose 609,640 citizens to cancer-related deaths in 2018, making cancer the second leading cause of death. Anyone who has been diagnosed with cancer or has had a loved-one diagnosed with cancer will agree that these alarming statistics demand the attention of more research. The literature indicated the MD as having a protective role on several types of cancer. There were several combinations of components related to the MD. The nine items are listed differently based on the article. One such combination is addressed here.

BACKGROUND

There is a plethora of cancer research with some studies focusing on genetics, some on lifestyle choices, and others on treatment plans, practices, and medications. Many of the studies reviewed state the same problem: there is a lack of evidence to quantify the relationship between different types of cancer and a healthy diet. "Approximately 5-10% of all tumor diseases are caused by genetic predisposition, while the pathogenesis of the remaining 90-95% can be explained by unfavorable environmental conditions of an unhealthy lifestyle. The latter can mainly be characterized by an unbalanced diet, lack of exercise, and consumption of alcohol and tobacco" [2].

Offering the MD as an example, Schwingshackl *et al.* [2] estimated 30% of cancers could be prevented by consuming a healthy diet, yet "due to the low number of studies available for several cancer types, we were not able to investigate properly" Repeated throughout the literature is the acknowledgment that more research is needed to determine the impact the MD can have on the risk for varies types of cancer.

PURPOSE

The purpose of this literature review was to allow evidence to guide and strengthen independent interventions implemented by nurses in the care of patients who are concerned about the risk of cancer. Patients often place their trust in the advice offered by nurses. As one who is often tasked to relay test results, the nurse has the responsibility to be up-to-date

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31

in knowledge, be ready to teach, answer questions, and offer interventions substantiated by evidence-based practice. As dietary intake sustains life, it would seem that poor choices in diet can also reduce life. By looking at the evidence in the medical literature, the nurse is prepared to provide the patients with education and insight for the pursuit of a healthy and life-sustaining diet. The question of concern was: In adults, how effective is adherence to the MD in reducing the risk of cancer?

LITERATURE REVIEW

Cancer is a popular and well-funded topic for research. Because cancer emotionally impacts so many, it has the potential to bring out unsubstantiated opinions and untested theories to reduce its risk. The emotional implications of this type of study could bend a researcher to use personal biases. Therefore, it is imperative that interventions and treatments be based on evidence, supported by ethical and quality research, and the conclusions proposed be accurate and trustworthy.

Method

The review of the evidence was facilitated through searching and examining three databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed/MEDLINE, and Embase. The resources in this review were selected from a large number of articles discovered when using the search terms "*Mediterranean diet"* and *"cancer"* in each database. The large list of literature was narrowed by selecting the option of "*peer reviewed*" and focusing on recent articles published from March of 2016 and March of 2018. The remaining articles were then sorted by the evidence hierarchy, with only the top four levels considered.

Components of the Mediterranean Diet

There are nine basic components (see Figure 1) to the MD with whole grains as the first necessary member [3]. Unlike a processed grain that only uses the endosperm, a whole grain uses the entire kernel of grain including the bran, germ, and endosperm. Using the whole grain increases dietary fiber which is known to have many health benefits. The MD uses a variety of whole grains, including wheat, barley, oat, polenta, quinoa, and couscous.
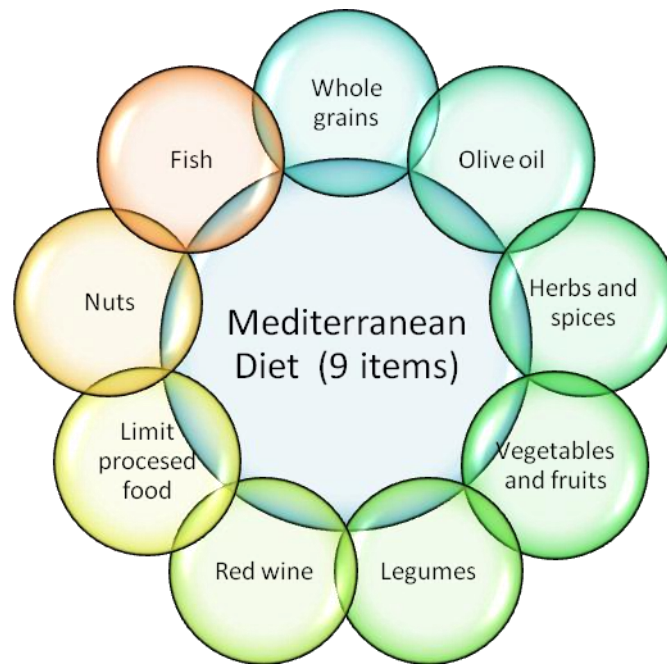
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32

Figure 1. **Nine components of the Mediterranean diet.**

Olive Oil is the second component of the MD. Rich in omega 3 fatty acids, olive oil is known to have anti-inflammatory properties, and is shown to "reduce DNA oxidative damage that is considered to be a crucial step in human carcinogenesis" [3]. It is the only added fat in the MD. Vegetables and fruits are high in dietary fiber and are the third component of the MD. Common fruits and vegetables from the Mediterranean region include tomatoes, grapes, spinach, kale, eggplant, cucumbers, figs, artichokes, bell peppers, and pomegranates. Legumes are widely used in the MD. D'Alessandro et al. report legumes are high in fiber, high in protein, and low on the glycemic index. Some common legumes are chickpeas, cannellini beans, peas, lentils, kidney beans, and black-eyed beans.

D'Alessandro *et al.,* [3] referred to red wine as the fifth component in the MD and declare it beneficial because of the polyphenols made up of flavonoids and nonflavonoids. It is common practice by those living in Mediterranean cultures to have a glass or sometimes two, of red wine with the evening meal of the day. It should also be mentioned that the Mediterranean culture seldom binges on alcohol. Red wine is one of the most controversial components of the MD because ethanol is classified by the International Agency for Research on Cancer as a human carcinogen. Nuts are the sixth component, followed by herbs and spices as number seven. The eighth component discussed by D'Alessandro et al. is fish which has been shown to protect the digestive tract from cancer. The MD was originated by communities of people surrounding the Mediterranean Sea, thus fish is the staple protein

Citation: Julianne Havens et al. Ijsrm.Human, 2018; Vol. 10 (1): 30-39.

33

source consumed. The ninth and final component of the MD is the limiting of processed foods, red meat, processed poultry and other meat, milk and dairy foods, and eggs. As part of the MD, these items are eaten in very limited amounts or not at all. All of these foods are high in saturated fat which means avoiding or limiting them will also be a heart-healthy choice [3].

Implications of the MD on Pancreatic Cancer

A cohort study conducted by the European Prospective Investigation into Cancer and Nutrition, in which 477,309 adult participants from ten European countries completed a quantitative Food Frequency Questionnaire (FFQ) and were followed for eleven years [4]. The FFQ outlined each of the MD components and assigned a score, using a point system of 0-16, with 0-5 as low, 6-9 as medium, and 10-16 as high adherence to the MD. At the completion of the study, Montes *et al.,* [4] reported the evidence did not support the claim of an inverse association between the MD and pancreatic cancer.

Implications of the MD on Lung Cancer

A cohort study performed in the Netherlands with 58,279 men and 62,573 women, between ages of 55-69 years, to investigate the association of the MD and the four most common types of lung cancer [5]. During the years of 1986-2006 the data was collected through self-administered questionnaires, asking participants to report on 150 items related to dietary habits as well as other risk factors. Utilizing the semi-quantitative FFQ, the authors gathered data measuring the adherence to the components of the MD using a scoring system of zero to nine. Schulpen and Barndt summarized the Netherlands' cohort 120,852 participant study by stating: "Though the inverse associations lacked statistical significance, the present study is in agreement with other cohort studies showing that high MD adherence might be associated with a reduced lung cancer risk and suggested that this inverse association might also be generalizable to non-Mediterranean populations" [5].

Implications of the MD on Nasopharyngeal Cancer

A hospital-based case-control study conducted in Italy between 1992 and 2008 with the goal of determining if the MD would have an inverse affect on the risk of nasopharyngeal cancer [6]. A total of 792 adult participants consisting of 198 confirmed nasopharyngeal cancer cases and were matched in a ratio of 3:1 with 594 controls according to sex, age (±2 years),

Citation: Julianne Havens et al. Ijsrm.Human, 2018; Vol. 10 (1): 30-39.

34

and period of intake into the study. The cases and controls were given an approved and valid FFQ that measured adherence to the MD, including each of the nine dietary components. Turati *et al.* used the answers to the FFQ to figure the Mediterranean Diet score (MDS) ranging from 0, minimal adherence, to 9, maximum adherence to the MD [6]. The data from this study presented a significant inverse relationship between adherence to the MD and risk for nasopharyngeal cancer. "Subjects with a MDS of 6 or more have an almost 35% decreased risk in comparison to subjects with a score of 4 or less" [6]. The inverse association of risk of nasopharyngeal cancer is even more evident with the intake of vegetables, particularly those with yellow or red pigments, as compared to the intake of fruits, which was not as statistically evident. The overall conclusion of this study provided sufficient evidence to support the MD to improve one's risk to avoid cancer at the nasopharyngeal site [6].

Implications of the MD on Endometrial Cancer

Not a type of cancer often addressed in the United States; it was surprising to learn that endometrial cancer is the fourth most common cancer in European women [7]. Addressing the need for more research, "The evidence of an association between endometrial cancer risk and specific dietary components is limited and includes a publication from the World Cancer Research Fund, which reported a probable beneficial association between coffee consumption and endometrial cancer risk, a well as a possible negative association with glycaemic [*sic*] load" [7].

Ricceri *et al.,* [7] proposed a case-control study to investigate and analyze the role of vegetable and fruit intake, as is common in the MD, to lower the Dietary Inflammatory Index (DII) and thus lower the risk of endometrial cancer. In Northwest Italy, 297 women, ages 40 to 74 years old, and recently diagnosed with endometrial cancer, were recruited to be participants in the study. The 297 cases along with the control group of 307 women, also ages 40 to 74 years old, were asked to complete a questionnaire which included an FFQ. Other data collected in the survey included: oral contraceptive use, parity, age at menarche, current menopausal status, use of hormone replacement therapy, tobacco usage past and present, body mass index, physical activity level, and education. Ricceri *et al.,* determined this data, along with weight, height, and waist and hip circumference, to be collected by trained interviewers during face-to-face interviews upon acceptance into the study and before any cases beginning cancer treatments. The data collected were summarized in two indexes: a DII

Citation: Julianne Havens et al. Ijsrm.Human, 2018; Vol. 10 (1): 30-39.

35

index and the MD index. Scores for the MD index were figured by eight dietary habits definitive of the MD, with 0-3 habits as low adherence, 4-5 habits as moderate adherence, and greater than 6 habits as high adherence [7]. Low adherence to the MD was at 53.20% for cases, while controls were 37.46%; moderate adherence was 37.37% for cases, while controls were 46.58%; and in high adherence, cases were only 9.43%, while controls were 15.96%. The conclusions drawn suggest that a high vegetable intake, as is found in adhering to the MD, is shown to lower the risk of endometrial cancer [7].

Implications of the MD on Breast Cancer

A case-control study conducted in Italy and Switzerland comprised of 3,034 breast cancer cases and 3,392 controls [8]. All were women, and all were between 19-79 years old, with a median age of 55.5. Using trained interviewers to administer the questionnaire, the cases and controls reported lifestyle habits, family history of cancer, and personal medical history, which included BMI, use of contraceptives, use of hormone replacement therapy, and other data related to the participant's menstrual cycle. Also included in the interview was a validated and reproducible FFQ which gathered data about nine components of the MD. Scoring of the FFQ results was between 0-9, with high adherence at 6-9 points, medium at 4-5 points, and low scoring 0-3 points. The data was analyzed and those women in the high adherence grouping were found to have a 20% decrease in risk for breast cancer than the low adherence group [8]. In addition to the large sample size, the strengths of their study were reproducibility, validity, and the commonality of the MD among the participants. Turati et al. concluded a modest but relevant finding for an inverse association with a high adherence to the MD and the reduced risk of breast cancer [8].

Implications of the MD on Prostate Cancer

Prostate cancer is the second leading cause of cancer in men around the world. Nutritional factors play a role in cancer development; however, a healthy diet such as the MD and its components, especially olive oil, could exert a protective role in prostate cancers [9]. In a study on the MD and risk of prostate cancer, Urquiza-Salvat *et al.,* [10] found, adherence to the MD was associated with lower PC aaggressiveness based on Gleason score. In Europe, countries following the MD have lower PCa incidence and mortality compared to other European regions. Bosire *et al.,* [11] reported no relationship between the MD score diet and the risk of PCa in the National Institutes of Health (NIH)-AARP Diet and Health Study

Citation: Julianne Havens et al. Ijsrm.Human, 2018; Vol. 10 (1): 30-39.

36

cohort (293,464 US men). Because of the contradictions in studies, the impact of the MD on prostate health remains unclear.

SUMMARY OF RESEARCH EVIDENCE

Each study, whether cohort, case-control, or meta-analysis, used a version of a FFQ to collect data. Even though each study used different questionnaires, the concepts and components of the MD were consistent between studies. Strength to consider is that each of these studies was conducted in the general area where the MD originated and because of this, each of the components of the MD was common and readily available to the participants. Each of the studies in this literature review had the common goal of determining the relevance of the MD in reducing the risk of cancer in an adult population. Although it cannot be said that each study had the same outcome, it can be stated that each study did conclude the need for more research to be done in this area. "Overall, there is epidemiological evidence that components of plant-based food diet have a protective role in cancer prevention" [3]. Despite this bold declaration (see Figure 2), "the protective role of the MD against cancer has not definitely been established" [3].
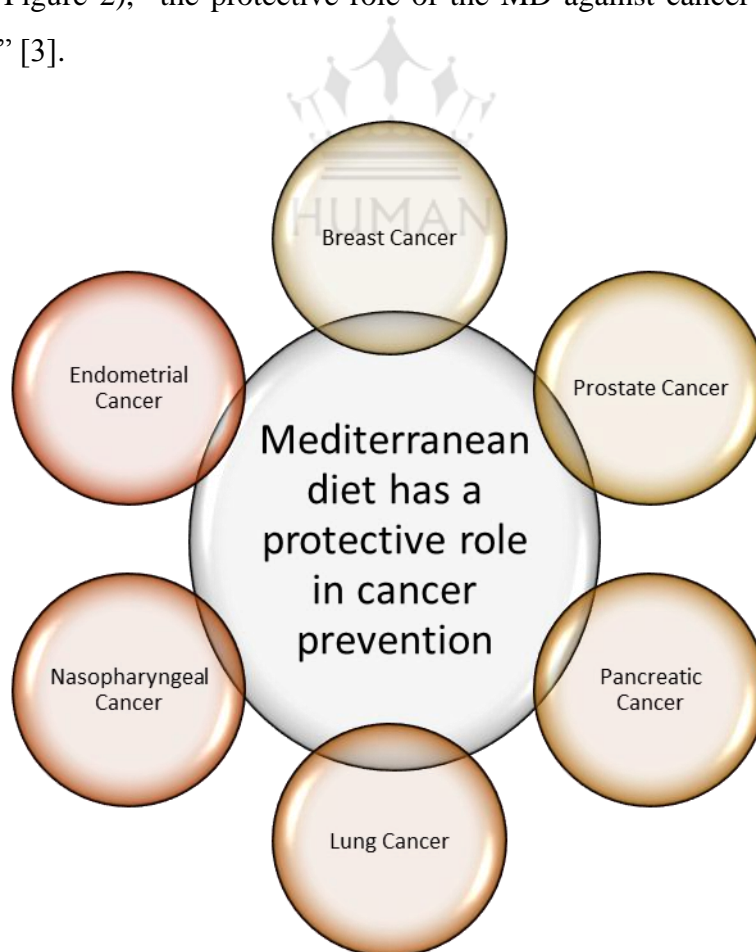

Figure 2. **The implications of the MD on various types of cancer.**

Citation: Julianne Havens et al. Ijsrm.Human, 2018; Vol. 10 (1): 30-39.

37

Montes *et al.,* [4] determined there was insignificant evidence to support the claim that the MD reduces the risk of pancreatic cancer. Schulpen and Barndt [5] reported their study did not support the claim of the MD decreasing the risk of lung cancer. Turati *et al.,* [6] concluded the MD does reduce the risk of nasopharyngeal cancer. Ricceri *et al.,* [7] evaluated the data and determined the MD reduced the risk of endometrial cancer. Turati *et al.,* [8] found in their study that women with a high adherence score to the MD had a 20% decrease in the risk for breast cancer than women with a low score. In summary, the studies indicated adherence to the MD by adults, was not necessarily effective in decreasing the risk of pancreatic or lung cancers but was found to be effective in reducing the risk in nasopharyngeal, endometrial and breast cancers. With this evidence, healthcare professionals can teach and advise patients that the MD will reduce the risk for certain types of cancer.

RECOMMENDATIONS

Despite opposing conclusions, the authors of the literature reviewed agreed there is a need for more research to be done. Perhaps the focus of future research should be narrowed by determining which components of the MD are responsible for effectiveness in reducing specific cancers. By concentrating the analysis to possible interventions such as increasing plant-based foods, using only olive oil, or reducing intake of red meat, the research could provide insight into specific dietary changes that make the biggest impact. Perhaps research should determine if the MD components work synergistically, creating an inverse response between high adherence to the MD and lowering the risk for specific cancers. As cancer is the second leading cause of death in the United States [1], it is recommended that continued research is performed on dietary intake as it relates to the reduced risk of cancer.

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38

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HUMAN

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39