



Benefits of Personalized Diet, Nutrition, And Exercise Programs for Cancer Survivors

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Abstract: Nutrition, diets, and exercise are critical pillars in fortifying the well-being of cancer survivors. A balanced and nutrient-rich diet serves as a linchpin in the recovery process for cancer, providing essential vitamins and minerals crucial for rejuvenating weakened immune systems and promoting overall health. The comprehensive influence of nutritional variables, including weight, food, physical activity, and alcohol use, goes beyond cancer development and affects outlook; the standard of living, concurrent health conditions, reappearances, and the incidence of recurrent malignancies are important factors to consider. However, despite their undeniable importance, a comprehensive understanding of their correlating effects on cancer survivors is hindered by the relatively recent and limited literature. This review aims to address existing gaps in current research, emphasizing recent studies and reviews related to nutrition, diets, alcoholic beverages, obesity, and exercise in cancer patients. This review focuses on specific areas necessitating further investigation by synthesizing and scrutinizing the latest findings. By exploring recent advancements, the goal is to contribute to a profound understanding of tailored nutrition plans, specific diets, lifestyle modifications, and exercise regimens, which can strategically enhance cancer survivors' well-being and long-term outcomes.

Keywords: Nutrition, physical exercise, obesity, weight management, Cancer Survivors

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I. INTRODUCTION

Nutrition, diet, and exercise play critical roles in supporting the well-being of cancer survivors. A balanced and nutrient-rich diet can aid in recovery by providing essential vitamins and minerals, helping to rebuild weakened immune systems and enhance overall health. Incorporating proteins, fruits and vegetables, and whole grains promotes optimal healing. Tailored diets may address specific needs arising from cancer treatments. Regular exercises, such as walking, yoga, or low-impact activities, boost physical strength and foster mental resilience. Consultation with healthcare professionals or nutritionists ensures personalized plans, adapting to individual needs and fostering a holistic approach to post-cancer recovery and long-term well-being. Factors related to nutrition, including weight, diet, physical activity, and alcohol consumption, have been recognized for their impact on the initiation of cancer. Moreover, these factors are critical for the predicted outcome, standard of living, presence of other medical conditions, cancer relapse, and subsequent malignancies. While the literature on these elements is relatively new and limited, current research emphasizes that the importance of dietary variables in cancer extends beyond the first stages of its development. The benefits of adhering to a diet abundant in plant-based foods and whole grains, coupled with regular physical activity and achieving a favourable weight, are enhanced by the synergistic influence of nutrition and exercise. Limited research has conducted thorough analyses of scientific literature to assess the advantages of physical exercise and smoking cessation in individuals with cancer, acknowledging the importance of lifestyle variables in cancer management. These studies have the objective of providing education to both healthcare professionals and patients. Some cancer is mostly linked to nutritional deficiencies that pose a significant risk at different points in time, starting at the time of diagnosis and continuing throughout the entire healthcare treatment journey. These problems include significant weight loss, which is especially common in lung and esophageal malignancies, and malnutrition, which is widespread in lung, esophageal, colorectal, pancreatic, gastric, and liver cancers¹. Furthermore, it is important to be careful with any increase in body weight in colon, breast, and kidney cancer cases. Similarly, it is advisable to constantly observe and control alcohol intake in connection to upper aero intestinal malignancies. Following cancer therapies, it is important to recognize and treat the issue of excessive weight, particularly in instances of colorectal, breast, and kidney malignancies. This ensures the importance of comprehensive nutritional surveillance throughout the cancer treatment spectrum to manage better and mitigate the impact of varying nutritional challenges associated with different cancer types. Presently, there is a burgeoning focus on novel dietetic avenues, particularly tailoring diets to individual needs. This paradigm shift encompasses several key aspects: Genetic studies are underway to ascertain individuals' predispositions to specific types of food and their susceptibility to food-related diseases³. Furthermore, the study focuses on comprehending the variety of the human microbiota, digestive traits, and the condition of the intestinal barrier^{4,5}. Research is being conducted to analyze the specific reactions. The research seeks to investigate how the immune system responds to food antigens, focusing on detecting alterations in food tolerance and evaluating the efficiency of the adaptive immune response. The actions of lymphocytes modify this adaptive immune response. It is a vital defensive mechanism that safeguards living organisms against infections and eradicates foreign

invaders⁶⁻⁹. These three interconnected areas of exploration collectively contribute to the development of personalized dietary approaches, marking a significant difference from conventional dietetics. The integration of genetic, microbiota, and immunological insights holds promise for tailoring dietary recommendations to address individual variations in health and well-being. Diets designed for cancer patients hold promise as complementary approaches to traditional cancer treatments. Although the basic principle of denying cancer cells nourishment to hinder tumor development is acknowledged, implementing this notion in medical settings presents difficulties. Various dietary strategies have been examined, such as the calorie-restricted diet, which involves restricting carbohydrate intake, and the ketogenic diet, distinguished by its low carbohydrate content and high-fat consumption. Diets that include small variations in the content of amino acids have been shown to decrease tumor development in mice, especially when used in conjunction with chemotherapy or radiation¹⁰. Nevertheless, the effectiveness of these diets in cancer patients is mostly substantiated by individual case studies, posing challenges in establishing conclusive findings about their influence on disease outcomes. Concurrently, progress in comprehending tumor lipid metabolism has revealed insights into the significance of fatty acids in producing cancer cell survival, growth, and spread within the tumor microenvironment. A high-fat diet might potentially promote cancer progression by increasing the presence of fatty acids, which in turn can diminish the effectiveness of tumor treatments. Significantly, polyunsaturated fatty acids, a group of lipids that have strong toxic effects on tumors, show potential as a dietary supplement to improve results for individuals with cancer. Guidelines for a nutritious human diet prioritize Promoting the eating of whole grains, vegetables, fruits, and legumes while opposing the intake of red meat and processed meals. that are high in fat, carbohydrate, and sugars. It is recommended to abstain from consuming alcoholic beverages and sugary drinks. The long-standing Mediterranean diet adheres to these recommendations, emphasizing the recommended dietary choices that include whole grains, nuts, seeds, vegetables, fruits, and seafood in your diet while refraining from consuming processed meats. It is recommended to utilize olive oil as the primary source of dietary fat, given its incorporation of short-chain fatty acids, antioxidants, and omega-3 polyunsaturated fatty acids. this diet is believed to contribute to its health advantages in preventing cancer^{11,12}. Moreover, the Nordic diet, a nutritional regimen akin to the Mediterranean diet but more often followed in northern areas, has garnered significant attention for its possible beneficial effects on health¹³. The duration of cancer symptoms may vary, spanning from brief periods of days to longer durations of weeks or even years. Similarly, the long-term effects of cancer treatment can also last for varying amounts of time.¹⁴ Physical activity is a term that encompasses any bodily movement performed by the muscles, resulting in the use of energy. This activity includes spontaneous everyday motions, intentional workouts that include planned and repeated activities, and engagement in community-based or competitive sports¹⁵. This review also investigates the influence of physical exercise on the physical, mental, and emotional components of harmful effects linked to cancer. When considering the physical consequences, it is crucial to consider the occurrence of osteoporosis and metastasis of cancer to distant sites in the body, changes in body composition, wasting syndrome, swelling of the limbs, and damage to the peripheral nerves. The psycho-physical parts include sensations such as pain, exhaustion, and sleep

disturbances, while the psychological domain encompasses factors such as depression, anxiety, and general well-being. Each feature is examined thoroughly in terms of its description, influence on cancer or cancer therapy, and the range of drug- and non-drug-based therapies.

1.1 Nutrition

Nutrition and dietary factors represent pivotal external elements crucial for immune defense responses, influenced by internal sources such as body fat stores and muscle composition. Calder et al., explained how consuming a meal may cause inflammation throughout the body after eating, leading to oxidized substances. Upon absorption, there is an occurrence of oxidative stress and inflammatory responses. After ingestion, there is an increase in inflammatory mediators in the circulatory system, which may pose a risk to those with type 2 diabetes and obesity¹⁶. The impact of the gut microbiota on immune responses is substantial. Inadequate intake of macronutrients and certain micronutrients may cause an imbalance that significantly weakens the immune system. This can notably impact cell-mediated immunity, phagocyte function, levels of secretory IgA antibodies, and generation of cytokines. Consequently, the immune system cannot trigger an efficient response due to insufficient biocomponents. These dietary restrictions result in a diminished migration of white blood cells toward inflamed areas and a decreased production of the chemokine macrophage inflammatory protein. A thorough understanding of the intricate connection between nutrition, immunity, and microbiota is crucial for successfully dealing with the many factors contributing to immune-mediated health effects. Malnutrition detected during diagnosis may manifest as a Reduced body mass index, weight loss, or sarcopenia. (sometimes referred to as myopenia). There is compelling data that shows a strong connection between malnutrition and increased overall mortality, as well as a higher likelihood of recurrence and disease advancement in persons with colorectal cancer^{17,18}. There are connections between malnutrition and increased overall death rate in those who have been diagnosed with lung and stomach cancer. When evaluated in sarcopenia, the correlation between malnutrition and esophagus, liver, and pancreatic malignancies is significant. Moreover, the assessment of malnutrition by sarcopenia is linked to an increased risk of cancer-related outcomes, death rates in stomach cancer, and a heightened likelihood of recurrence in patients with liver and stomach cancer^{19,20}. Early research also indicates connections between malnutrition and diverse outcomes in other forms of cancer. There is evidence suggesting that Malnutrition is linked to elevated overall mortality rates in individuals with Cancer-specific mortality rates are elevated in individuals with lung cancer, there is an increased likelihood of cancer recurrence in those with upper aerodigestive tract cancer, and heightened overall mortality rates and risk of recurrence are observed in individuals with nasopharyngeal cancer. Additionally, cervical and kidney cancers are associated with specific mortality rates²¹. Furthermore, there is a correlation between malnutrition and increased rates of death in general, as well as higher rates of death, specifically from cancer. Additionally, individuals with solid tumors who are malnourished have a greater likelihood of experiencing a recurrence of their condition. Patients with hematological malignancies who experience malnutrition have a greater risk of overall death and are more likely to have disease progression^{22,23}. Limited evidence suggests that offering dietary guidance for weight reduction is associated with a reduced risk of cancer-related mortality and a decreased

chance of cancer recurrence in individuals diagnosed with colorectal cancer²⁴. Health promotion initiatives focused on nutrition are crucial for adolescent cancer survivors and patients, given their tendency towards unhealthy dietary habits²⁵. These habits not only have the potential to contribute to undesirable weight gain but may also increase the risk of developing other chronic diseases or experiencing recurrences and secondary cancers. The accessibility of the Internet presents an opportunity to leverage online platforms for nutritional counseling tailored to children and adolescents who have overcome cancer. Despite substantial endeavors to create tools for advancements in nutritional risk screening and assessing nutritional status in the pediatric cancer population, a significant research gap persists. More specifically, there is a shortage of studies investigating the use of web-based nutrition interventions for teenagers with cancer survivors. Recognizing the significance of this demographic and the prevalence of digital access among them, exploring the potential of online resources could enhance efforts to support their nutritional well-being in the post-cancer phase. Even with increased protein and energy intake, relying solely on behavioral counseling proves inadequate for ensuring optimal nutrition. Yang et al.²⁷ It was shown that using a mobile health coaching software aimed at promoting self-care in terms of food did not effectively reduce excessive muscle wasting in esophageal cancer patients undergoing neoadjuvant chemotherapy, despite its good influence on Self-care related to eating. The study's results suggest a customized therapeutic strategy; it is essential to incorporate suitable physical activity and nutritional assistance to minimize muscle atrophy and manage malnutrition. The introduction of health education for individuals undergoing chemotherapy for pancreatic ductal adenocarcinoma led to a noteworthy enhancement in their nutritional status, as evidenced by the PG-SGAP score.²⁸ This improvement was seen irrespective of the use of the noom application. Users of the Noom app exhibited statistically significant improvements in their overall health condition and enjoyment of life, as assessed by the EORTC QLQ measures when compared to persons who did not use the app²⁹. During treatment, both groups saw a reduction in the skeletal muscle index. Nevertheless, the group of individuals who did not use the Noom app had a more significant reduction than those who did use Noom, though this disparity did not reach statistical significance. The findings suggest that mobile app-based coaching has the potential to assist pancreatic ductal adenocarcinoma patients undergoing chemotherapy in enhancing both their nutritional and overall health status.

1.2 Diet

Conversations on food and health are considered very complex topics in both public discussions and scientific domains. Ongoing debates have focused on the influence of nutritional components and dietary habits on altering susceptibility to gynecological diseases. To assess the influence of nutrients on the growth and advancement of Inflammatory Bowel Disease, it is necessary to analyze the dietary factors thoroughly. A current study on dietary variables emphasizes the need to examine whole dietary patterns rather than only concentrate on particular nutrients.³⁰ This approach reveals that understanding the complexities of inflammatory bowel disease relies on a comprehensive understanding of overall dietary habits. It is essential to include nutritional factors when considering optimizing treatment for cancer patients. The main reason is based on the requirements of rapidly multiplying cancer cells to meet their demands for building

molecules and obtaining energy. These requirements may need Specific nutrients, or increased quantities of standard nutrients may exceed the metabolic requirements of healthy cells, even if both are derived from the same biological lineage³¹. By capitalizing on these particular requirements, there is an opportunity to focus directly on cancer cells dependent on specific nutrients. In recent decades, various diets have been evaluated in individuals diagnosed with cancer. A cancer-inhibiting diet differs from a conventional diet regarding the specific balance of macro- and micronutrients and the specific amounts of these nutrients³². Another approach to exploit irregularities in cancer metabolism includes selectively targeting certain amino acids. Specific amino acids have critical functions in metabolic pathways that support vital biosynthetic activities. Hence, diets that target certain amino acids may be significant in treating cancer. Amino acids that have been well studied and shown to have inhibitory effects on tumor development when lacking in the body include leucine, lysine, and methionine, which falls under the category of essential amino acids. At the same time, serine, glycine, glutamine, and asparagine are considered non-essential.³³ Mouse models have demonstrated the effectiveness of dietary interventions lacking serine, glycine, or methionine.³⁴ To comprehend the influence of diet, it is crucial to consider the broader effects of dietary patterns, since humans seldom consume meals in isolation. This allows for a comprehensive assessment of how different foods and nutrients interact and contribute to the functioning of the diet. Specific types of cancer may have positive impacts from particular dietary patterns and specific food choices. Embracing a diet low in fat has been associated with a reduced overall mortality rate and a diminished likelihood of breast cancer recurrence in patients, substantiated by a substantial body of research^{35,36}. Different research studies have employed adherence scores to evaluate compliance with particular dietary recommendations. The purpose of this researches was to examine the influence of nutrition on patient prognosis, taking into account other health habits such as physical activity and alcohol intake. Nevertheless, the data has not yet reached a satisfactory threshold to establish conclusive findings. Following a nourishing diet is vital for maintaining an optimal body weight and providing vital nutrients that prevent cancer. Equally crucial is to avoid foods that increase the risk of cancer,³⁷⁻³⁹ either directly or indirectly, by supplying empty calories. Individuals who follow a nutritious diet often have lower body weights and a decreased overall. The focus is on acquiring essential nutrients from dietary sources rather than depending on supplementary products. The phrase "prudent" diets refers to food patterns that meet certain nutritional requirements. Conversely, "Western" diets are often characterized by elevated quantities of meats, processed foods, fats, and sweets in their nutritional composition. Therefore, it is not recommended to utilize dietary supplements to avoid cancer; it is necessary to undergo clinical tests to confirm a deficit or see a qualified nutritionist to examine whether an individual's diet consistently lacks certain nutrients. Even in such instances, promoting the acquisition of nutrients from natural food sources is desired, highlighting the need for a comprehensive and balanced dietary strategy. Several organizations have formulated evidence-based dietary recommendations to mitigate the likelihood of cancer.⁴⁰⁻⁴² The guidelines advise promoting a healthy lifestyle, and it is advisable to limit the consumption of fat, especially from animal sources. Instead, focus on increasing dietary fiber intake by incorporating diverse vegetables and fruits into your daily meals. Regular physical activity is also crucial for

maintaining good health. It is important to strive to maintain an optimal body weight and drink alcoholic beverages in moderation or abstain from them entirely. Furthermore, it is advisable to reduce the intake of salt-cured, salt-pickled, or an investigation into modifiable risk factors, such as red meat consumption, obesity, low folic acid intake, physical inactivity, alcohol use, and early adulthood cigarette smoking, was conducted by the Health Professionals Follow-Up Study to analyze their correlation with colon cancer. The findings suggest that a significant portion of the risk of developing colon cancer in middle-aged American men may be influenced by these factors and possibly be prevented. To be precise, if all males were classified in the lowest 20%, 10%, and 5% of the risk scores, there would be a reduction in risk of 39%, 48%, and 55%, correspondingly⁴³. This study explores the intricate relationships between dietary, nutritional, and metabolic characteristics, various lifestyle factors, and the likelihood of cancer development. The methodology includes gathering and storing blood samples for an extended period to analyze potential biomarkers associated with cancer.⁴⁴ An instance of such attempts is the European Prospective Investigation into Cancer and Nutrition, which includes a molecular epidemiology component, helps to provide a more precise evaluation of differences in cancer susceptibility across different populations. Furthermore, these investigations contribute to the identification of certain subgroups within populations that are more prone to developing cancer, therefore facilitating the creation of focused and efficient strategies for cancer prevention⁴⁵. Some dietary supplements, when used with medical supervision after a cancer diagnosis, may provide potential advantages for some forms of cancer. Research suggests that breast cancer patients who use vitamin C supplements may experience decreased overall mortality and cancer-specific mortality.⁴⁶ The available evidence indicates a possible link between using vitamin D or E supplements and a decreased likelihood of breast cancer recurrence, relying on restricted data. Branched-chain amino acid supplements have been associated with decreased overall mortality in persons diagnosed with liver cancer. However, it is crucial to use caution since the study suggests the presence of potential metabolic or vascular risks.⁴⁷ However, caution must be used when administering vitamin E-based dietary supplements to individuals with upper aerodigestive tract cancers. The American Cancer Society has cautioned that these supplements may result in detrimental outcomes, including increased susceptibility to overall and particular mortality.⁴⁸ Moreover, it is worth mentioning that administering large amounts of antioxidants has shown the ability to restore oxidative harm caused by cancer cell therapies, which might reduce the efficacy of these therapeutic interventions^{49,50}. A review of the existing information and the specific traits of each patient is crucial for making informed decisions about the appropriate use of dietary supplements during cancer therapy. Dietary patterns display differences in the composition of their nutritional constituents. Rich in minerals, vitamins, fiber, and phytochemicals, whole grains like brown rice, barley, and wheat regulate immune responses and reduce oxidative stress. These substances, including vitamin E, carotenoids, inulin, and lignans, contribute significantly to these functions⁵¹. Conversely, nuts boast beneficial (unsaturated) fats that correlate with a lowered risk of obesity, diabetes, and cardiovascular diseases. Fruits and vegetables are renowned for their rich concentrations of vitamins, minerals, and dietary fibers. Moreover, they contain substantial quantities of antioxidants, such as β -carotene, vitamin C, and

vitamin E. Meat stands out for its high levels of protein and saturated (unhealthy) fatty acids. It also harbors N-nitroso compounds, heterocyclic amines, and polycyclic aromatic hydrocarbons, all recognized as mutagens. Conversely, fish offers essential protein, minerals, and omega-3 fatty acids, which have been associated with a reduced risk of developing cardiovascular disease. Green tea, extensively studied for its

positive effects, encompasses a compound known as epigallocatechin-3-gallate (EGCG). Catechin, a chemical compound, has garnered considerable interest due to its potent antioxidant and anti-tumorigenic characteristics. In the next sections of this review, we will comprehensively analyze the Effects of various food components and nutritional elements on the occurrence of common gynecological issues.

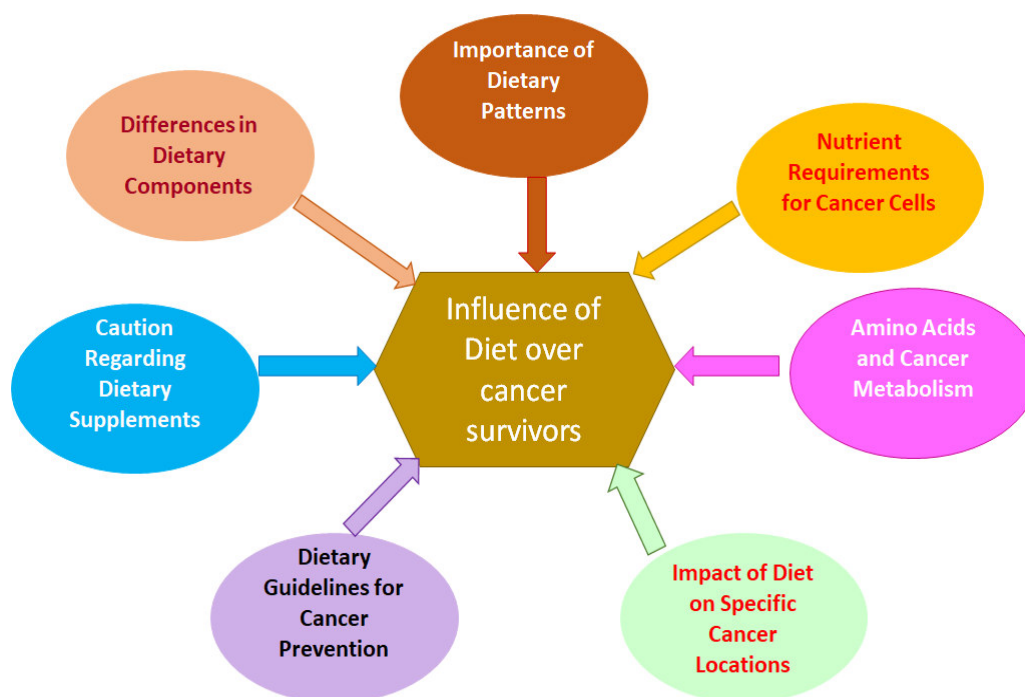


Fig 1: Influence of Diet on Cancer Survivors

1.3 Obesity

The impact of being overweight or obese after being diagnosed with cancer might vary depending on the precise site of malignancy⁵². There is a correlation between obesity in women who have been diagnosed with non-metastatic breast cancer and an increased probability of having a second malignancy.^{53,54} This relationship is backed by strong and compelling evidence suggesting a higher overall and cancer-specific death rate in this group. In many instances, being overweight or obese is also likely to contribute to an increased chance of recurrence. Patients diagnosed with colorectal cancer, especially those categorized as obese, have a strong correlation with elevated overall mortality and a greater likelihood of recurrence, as supported by existing research. In individuals with kidney cancer, both overweight and obesity are strongly correlated with elevated overall mortality rates. In contrast, overweight and obesity in lung cancer patients are linked to lower overall and cancer-specific death rates. Patients with esophageal cancer have comparable favorable results in terms of overall mortality^{55,56}. Recent studies indicate a possible association between higher body weight and reduced cancer-specific survival in individuals diagnosed with stomach cancer.⁵⁷ Furthermore, several research suggest a correlation between weight increase and a decreased overall death rate or a diminished likelihood of disease advancement in individuals with lung cancer⁵⁸. The results emphasized the intricate and situation-specific connection between body weight and the consequences that occur after being diagnosed with cancer. The fluctuations in body weight that occur with cancer therapy have been recorded for several years⁵⁹. Studies indicate that these alterations may appear as either an increase or decrease

in body weight⁶⁰ and this variability can be impacted by several variables in individuals who have survived breast cancer. The factors that influence this include genetic predisposition⁶¹, socio-demographic characteristics^{62,63}, menopausal status⁶⁴, hormone receptor status⁶⁵, and clinical parameters such as tumor size, histological grade, degree of differentiation, presence of lymph node metastasis, and the chosen treatment approach. The weight gain seen in cancer survivors is often linked to a lack of physical activity and a sedentary lifestyle. This weight gain typically reaches its highest point in the third year after diagnosis, as shown during a six-year follow-up period^{66,67}. On the other hand, research suggests that overweight or obese breast cancer survivors may achieve weight reduction of more than 5%^{68,69}. Nevertheless, most research has predominantly used an observational methodology, resulting in a scarcity of strong empirical data from treatments to adequately inform the management of body weight for individuals who have survived cancer. Body weight reduction is often disregarded in overweight breast cancer survivors, as stated by.⁷⁰ There is an urgent need to combine current research to suggest the most appropriate method, its level of intensity, and the particular categories of participants for the influence of obesity. Obesity influence over cancer intends to provide information to survivors, healthcare professionals, and policymakers engaged in survivorship care. The importance of weight, the management of weight, and steps for controlling weight are vital not only Regarding the risk of cancer but also the survival rates of cancer patients. The available research about the correlation between obesity and outcomes for different types of cancers is varied, and there is an increasing amount of research highlighting the beneficial effects of obesity reduction and physical exercise on

breast and colon cancers⁷¹. This research investigates the variables to consider when choosing the optimal dose of chemotherapy and radiation treatment for obese individuals. It highlights the possible consequences of therapy-related side effects. It initiates a discourse on recommendations for advising patients on weight reduction and heightened physical exertion, supported by demonstrating that greater physical activity adds to a better quality of life in those who have survived cancer. Given the increasing societal impact of obesity, practitioners are being strongly encouraged to prioritize this problem. They should acknowledge its importance not only in preventing cancer but also in improving outcomes after a cancer diagnosis. The correlation between obesity and an increased susceptibility to aggressive prostate cancer, as well as its recurrence and death rates, is well acknowledged. However, there is a scarcity of research on weight management programs specially designed for individuals diagnosed with prostate cancer; the available research is quite recent.⁷² Research was conducted to investigate the possibility of physical exercise in reducing the loss of lean tissue in males receiving androgen deprivation treatment. The trial included a self-help strategy including dietary and physical activity components, supplemented by supplementary nutritional assistance to regulate weight. The findings demonstrated a lower reduction in body weight had a significant improvement in the overall well-being of males receiving therapy for prostate cancer. In contrast⁷³ conducted a study on a customized weight management program for males. The research not only showcased the program's efficacy in addressing weight concerns in obese men before prostatectomy but also revealed significant favorable effects on other health markers. The program, which focuses on coaching individuals on their lifestyle, the implementation of strategies such as meal substitution, promotion of physical activity, and the use of self-monitoring technologies resulted in significant decreases in visceral adiposity, the ratio of leptin to adiponectin, C-peptide, insulin, blood glucose levels, central adiposity, and systolic blood pressure.⁷⁴ This study illuminates the potential advantages of focused weight control measures in improving the health outcomes of men coping with prostate cancer.

1.4 Alcoholic Beverages

Limited research has explored the connections Association between alcohol use after diagnosis and cancer prognosis. The existing data indicates a likely association between alcohol use and a higher likelihood of cancer recurrence in people with colorectal cancer⁷⁵. Alcohol use has been linked to a higher vulnerability to developing cancer in several parts of the body, including The anatomical structures mentioned, including the mouth, throat, larynx, esophagus, liver, colorectum, and breast. Simultaneous use of tobacco and alcohol significantly enhances the likelihood of developing cancers in the oral cavity, larynx, and esophagus. To mitigate possible risks, it is advisable for those who use alcohol to restrict their Limited alcohol consumption to a maximum of two alcoholic beverages per day for men and one alcoholic beverage per day for ladies. Alcohol use is associated with increased calorie consumption, which adds to issues of excessive weight and obesity. Recent research indicated that premenopausal women who drink more than 10 grams of alcohol daily may exhibit elevated levels of estrogen and breast density, both of which are significant factors in assessing the likelihood of developing breast cancer⁷⁶. There exists a positive correlation between the quantity of alcohol ingested and the probability

of acquiring cancer. The recommendation to encourage moderate alcohol use mostly stems from its ability to reduce cardiovascular mortality rather than its influence on cancer susceptibility. Hence, those with a substantial likelihood of acquiring breast cancer or those with extensive familial cancer backgrounds may consider abstaining from alcohol use. It is important to acknowledge the combined impact of different foods on health and to consider specific nutrients in the context of the whole diet. Embracing a healthy diet and restricting caloric intake are pivotal dietary strategies for cancer prevention, emphasizing the importance of maintaining a healthy weight. Alcoholic beverages, including wines, beers, spirits, ciders, and various locally significant libations, are pivotal in global social and cultural practices. These drinks gain their intoxicating attributes from ethanol, a byproduct of the fermentation process. When exploring the implications of alcoholic beverage consumption in epidemiological studies, diverse metrics come into play. These range from dualistic evaluations of drinking or abstaining to quantifying consumption through metrics such as the quantity of alcoholic beverages, glassware, or units containing 10 grams of alcohol consumed on a daily or weekly basis. The main way in which alcoholic drinks contribute to the development of cancer is via the pro-cancer effects of acetaldehyde, which is the main substance produced when the body breaks down ethanol. Acetaldehyde is recognized for its adverse influence on cellular processes, affecting variables like redox balance, radical formation, liver integrity, and hormonal levels. These molecular and pathophysiological alterations collectively elevate the risk of cancer development. Beyond acetaldehyde, the intricate interplay of diverse elements adds complexity to the correlation and the Correlation between alcohol use and the likelihood of acquiring cancer. Oxidation-reduction shifts in the body, the generation of free radicals, liver damage, heightened levels of sex hormones, folate deficiency, and the synergistic impact of concurrent tobacco smoking all contribute to the intricate network of mechanisms underlying the carcinogenic potential of alcoholic beverages⁷⁷. Recognizing these multifaceted connections is imperative for formulating comprehensive strategies aimed at mitigating the health risks linked to alcohol consumption.

1.5 Exercise for Cancer Survivors

Patients receiving cancer therapy often experience substantial alterations in their muscle and weight condition, which is attributed to either the illness itself or the therapeutic interventions. These changes may include the loss of muscle mass and an elevation of fatty tissue, leading to an augmentation in body mass. The association between greater fat mass and obesity and a higher likelihood of cardio-metabolic disorders adds to a higher death rate among those who have survived cancer⁷⁸. Conversely, a decrease in muscle mass may be a factor in the progression of cancer diseases, including cachexia., stressing the need to evaluate and prevent these changes promptly. Patients often experience substantial changes in muscle composition and body weight, which may be linked to the illness or the therapies they receive. These changes include reducing muscle mass and increasing fat formation and weight. There is a significant association between having a high amount of body fat and being obese and an elevated susceptibility to cardiovascular and metabolic disorders. This, in turn, leads to a higher likelihood of death among those who have survived cancer. On the other hand, the decrease in muscle mass might facilitate the progression of cancer-associated conditions, such as cachexia. Therefore, it is

essential to rapidly recognize and evaluate these changes in muscle and weight to avoid them from getting cancer. Cancer patients have noticeable muscular alterations characterized by a substantial decline in muscle strength and loss of muscle mass, influenced by both the disease and the treatments received. Multiple causes contribute to the decrease in muscle mass found in cancer, such as malnutrition, insufficient physical activity, alterations in metabolism, and increased levels of pro-inflammatory cytokines, namely Tumor Necrosis Factor- α , Interleukin-1- β , and Interferon- γ . These cytokines have been detected in muscle biopsies of cancer patients and are linked to the increased breakdown of muscle tissue. The reduction in muscle mass may be masked by the simultaneous rise in fat mass and weight gain caused by cancer treatments such as chemotherapy, corticosteroid drugs, and hormone therapy. Androgen deprivation treatment in prostate cancer patients often results in an augmentation of fat mass, which makes persons more susceptible to cardiovascular illnesses. This is also linked to a higher probability of cancer recurrence and increased mortality, especially connected with prostate cancer⁷⁹. Strategies for controlling weight gain and decreasing body fat include adopting dietary practices that emphasize the consumption of fruits, vegetables, and whole grains while limiting the consumption of fats, sweets, and refined flour. Engaging in physical exercise is crucial for minimizing these changes and preventing the development of cancer cachexia.⁸⁰ Physical exercise serves as a key intervention that has a beneficial impact on muscular strength decreases fat mass, and aids in managing weight growth. Furthermore, exercise induces cardiorespiratory and metabolic changes, such as lowered blood pressure, improved insulin sensitivity, decreased blood lipid levels, and increased management of blood sugar levels, all contribute to the prevention of co-occurring cardiovascular and metabolic conditions associated with cancer⁸¹. Cancer Cachexia is a paraneoplastic condition defined by a gradual decrease in skeletal muscle mass, sometimes accompanied by the depletion of fat stores. The deterioration in health cannot be fully restored with traditional dietary intervention, resulting in a steady reduction in functional capacity. Cachexia is responsible for directly causing about 20% of cancer-related deaths⁸². The cause of cancer cachexia is complex and involves factors such as reduced calorie intake and abnormal energy metabolism. Tumor cells release pro-inflammatory cytokines, including Interferon- γ , Tumor Necrosis Factor- α , and NF- κ B, contributing to these metabolic disorders⁸³. A significant alteration in protein metabolism that occurs with Cancer cachexia refers to the depletion of lean body mass. This condition is caused by an increased rate of muscle protein breakdown without a matching increase in protein synthesis, which either stays the same or slightly decreases⁸⁴. Both cancer and antineoplastic therapies, such as chemotherapy and radiation, contribute to

the development of cachexia and worsening nutritional imbalances due to side symptoms such as nausea, vomiting, dysphagia, mucositis, altered taste, fatigue, and systemic inflammation⁸⁵. The main goal in controlling cachexia is to mitigate the decrease in body weight and muscle mass, which may persist for up to one year after surgical excision of the cancer. An all-encompassing strategy includes many treatments, including dietary therapies to enhance protein consumption, pharmaceutical interventions to reduce inflammation and support nutritional equilibrium, and exercise therapy. Exercise may effectively prevent and treat cachexia by influencing inflammation and metabolism, which are the primary underlying factors of cancer cachexia⁸⁶. It affects the carbohydrate bio pathways, improving the absorption of glucose by muscles and increasing insulin sensitivity. This effect is seen even in individuals with cachexia who have problems with glucose intolerance and insulin resistance⁸⁷. Exercise enhances muscle protein synthesis, especially when paired with the supply of branched-chain amino acids⁸⁸. Peripheral neuropathy arises from damage to the peripheral nerves and can manifest in various forms. While it may appear as a paraneoplastic phenomenon in some cases, the predominant cause is often the side effects of anti-cancer treatments, leading to what is specifically Referred to as chemotherapy-induced peripheral neuropathy. Peripheral neuropathy often manifests as sensory neuropathy, defined by symptoms such as tingling, heightened sensitivity to pain, and pain caused by normally non-painful stimuli. The prevalence of chemotherapy-induced peripheral neuropathy is estimated to be about 68% in the first month after chemotherapy, decreasing to 60% at the 3-month point and remaining in 30% of patients at the 6-month milestone.⁸⁹ Patients significantly reduce muscle strength and mass due to muscular bioalterations, which are impacted by the illness and the medicines used. Malnutrition, physical inactivity, altered metabolism, and higher pro-inflammatory cytokines, such as Tumor Necrosis Factor- α , Interleukin-1- β , and Interferon- γ , contribute to lower muscle mass in cancer. Cancer treatments, including chemotherapy, steroid medicine, and hormone therapy, are linked to an elevation in fat accumulation, and subsequent weight gain can mask the loss of muscle mass. Exercise benefits cancer survivors, improving physical well-being, psychological benefits, and quality of life. Regular physical activity plays a vital role in preventing cancer recurrence by promoting a healthy immune system and managing inflammation. Beyond its physiological impact, exercise builds social connections among survivors, providing a supportive community that reduces depression and isolation. The positive effects extend to fatigue management, bone health, and cognitive function, contributing to emotional well-being. With exercise as a catalyst, survivors set and achieve long-term goals, establishing resilience and embracing a holistic approach to survivorship.



Fig 2: Influence of exercise over cancer patient

2. CONCLUSION

Diet stands out as a significant environmental factor linked to the etiopathology of inflammatory bowel disease. While numerous studies explore the association between diet and Inflammatory Bowel Disease, the focus often needs to be on correlation rather than establishing a causal relationship. As a result, our comprehension of the extent to which environmental factors, including diet, play a role is constrained. Currently, there needs to be more clarity on whether diet acts as a primary instigator or a secondary contributor to Inflammatory Bowel Disease, highlighting the complexity of understanding the precise impact of the influence of dietary variables on the initiation and development progression of this condition. Nutritional strategies, with therapies centered on the mediterranean diet and its distinct components renowned for their targeted antioxidant and anti-inflammatory characteristics, hold promise in enhancing and regulating the immune system. Despite conflicting findings, current evidence suggests that incorporating certain essential minerals, including vitamin D and zinc, into dietary supplements may modulate

immune system functionality. Nevertheless, research on the impact of individual nutrient supplementation regarding immune system function improvement remains constrained and is marked by limited studies and numerous methodological limitations. Many of these studies are characterized by low-quality methodologies and need comprehensive reporting of efficacy and safety outcomes. Consequently, there is a need for further rigorous investigation to better understand the specific benefits and potential risks associated with the supplementation of single nutrients in bolstering immune function and cancer intervention efficacy.

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3. AUTHOR CONTRIBUTION STATEMENT

Hatim.A. Natto wrote the initial draft. Dr Debananda Sahoo and N. Muneera contributed to critical revision and supervision. All authors reviewed the manuscript.

4. CONFLICT OF INTEREST

Conflict of interest declared none.

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