J Caring Sci, 2023, 12(3), 201-210
doi: 10.34172/jcs.2023.31768
https://jcs.tbzmed.ac.ir

Review Article

Health-Promoting Lifestyle among the Survivors of Colorectal Cancer: An Integrative Review

Elahe Ramezanzade Tabriz[1], Monir Ramezani[2,3*], Abbas Heydari[2], Seyed Amir Aledavood[4]

[1]Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[3]Department of Pediatric Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[4]Cancer Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Article Info

Article History:
Received: July 13, 2022
Accepted: September 3, 2022
e-Published: March 14, 2023

Keywords:
Health promotion, Lifestyle, Colorectal cancer, Survivors, Integrative review

***Corresponding Author:**
Monir Ramezani,
Email: Ramezanimn@mums.ac.ir

Abstract

Introduction: Health-promoting lifestyle (HPL) among the survivors of colorectal cancer (CRC) is essential to reduce CRC complications, prevent its recurrence, and improve survival. Nonetheless, there is no comprehensive definition for the concept of HPL in CRC survivors. This study aimed to define the concept of HPL among CRC survivors based on the existing literature.

Methods: This integrative review was conducted in 2021 using Whittemore and Knafl's method. The national and international databases of SID, Magiran, ProQuest, Medline, ScienceDirect, Web of Science, and Scopus were searched. Quality appraisal was performed using the Mixed Methods Appraisal Tool (MMAT) and the data were analyzed using the four-step approach proposed by Whittemore and Knafl.

Results: After data evaluation, 167 documents were included in final analysis. In total, 1863 codes were generated and categorized into eighteen main categories and the three main themes of antecedents, attributes, and consequences. Accordingly, HPL among CRC survivors was defined as "a set of behaviors in the areas of health responsibility, physical activity, nutrition, spiritual growth, psychological management, and interpersonal relations which are affected by socio-demographic characteristics, clinical characteristics, psychological status, physical conditions, time and place limitations, and patient education, and lead to better disease prognosis, better general health status, better bio-psycho-social status, and better quality of life".

Conclusion: The definition of HPL among CRC survivors provided in the present study can be used in counseling, educational, supportive, and care programs for CRC survivors in order to improve their quality of life and survival.

Introduction

Cancer is a major healthcare challenge throughout the world. In 2020, 19.2 million new cases of cancer were diagnosed and this rate is estimated to increase 25 million cases by 2030. Colorectal cancer (CRC) is the third most prevalent malignancy in the world with 1.9 million new cases and the second leading cause of death among cancers in 2020.[1] The five-year survival rate of CRC is 65%–90% in the world and this rate is as high as 92% for CRCs which are diagnosed in the non-metastatic stage.[2]

Despite its good five-year survival rate, CRC is associated with many different consequences and complications. For instance, CRC survivors are at great risk for cancer recurrence after treatment, secondary malignancies, cardiovascular disease, diabetes mellitus, osteoporosis, psychological disorders, and functional problems.[3,4]

Lifestyle is a significant factor affecting cancer-related outcomes. By definition, lifestyle refers to a series of daily activities which individuals consider as acceptable routine behaviors and have significant contribution to health.[5] Health responsibility is a main component of healthy lifestyle. It refers to the performance of actions and activities for maintaining and promoting health, including a healthy diet, adequate sleep, regular physical activity, weight control, cigarette and alcohol abstinence, stress management, personal development, and immunization against diseases. Healthcare measures should focus on empowering people for accepting health responsibility and adopting a healthy lifestyle.[6]

Health-promoting lifestyle (HPL) is a lifestyle which helps maintain and promote health.[7] By definition, health promotion is to empower individuals to identify factors

affecting personal and social health, make appropriate decisions about health-related behaviors, and adhere to a healthy lifestyle.[8] Health-promoting behaviors help individuals make lifestyle, social, and environmental changes in order to promote their health.[6] HPL helps CRC survivors find answers to their questions regarding dietary modification, physical activity, weight management, and risk of disease recurrence.[9,10]

Lifestyle has significant relationships with health-related outcomes. Studies on CRC survivors revealed that lifestyle modification has great effects on CRC recurrence and complications.[9,11,12] The World Health Organization also estimates that around 30% of cancer-induced deaths are related to behaviors such as limited intake of fruits and vegetables, weight gain, and limited physical activity.[13] Studies showed that western dietary pattern (which includes high intake of carbohydrates and high-sugar drinks) increased the risk of CRC recurrence by three times, regular physical activity after CRC diagnosis decreased disease recurrence and death rate by more than 50%,[14,15] and a normal body mass index decreased disease recurrence by 40%.[16] A study showed that death rate among patients with CRC who had normal weight, engaged in sixty-minute severe-intensity or 150-minute moderate-intensity physical activity per week, and received five meals of fruits and vegetables per day was 42% lower than those with no lifestyle modification.[17] Also, poor adherence to healthy eating, regular physical activity, and treatment regimen was associated with a higher risk of cardiovascular disease and metabolic disorders among patients with CRC.[18]

Despite the wealth of scattered and heterogeneous studies into the lifestyle and its components among CRC survivors, there is no comprehensive definition for the concept of HPL in this population. Moreover, HPL among cancer survivors largely depends on the immediate sociocultural and healthcare context, which can differ from other populations.[17-19] Therefore, systematic studies are needed to integrate different studies and provide a comprehensive definition of the concept. This definition of the concept of HPL in CRC survivors can be used in the design and planning care, training, counseling, and support services to modify the lifestyle and also improve the quality of life and survival of these patients in the long term. The aim of the study was to define the concept of HPL among CRC survivors based on the existing literature.

Materials and Methods

This integrative review was conducted in 2021. Integrative review is the most comprehensive literature review approach in which different theoretical, quantitative, and qualitative studies are integrated in order to provide a clear understanding about the intended subject.[20,21] Whittemore and Knafl's method was used in this integrative review. Their method has five main steps, namely problem identification, literature search, data evaluation, data analysis, and presentation.[22,23] The problem identification step was explained in the introduction section.

The literature search was performed in seven national and international databases, namely SID, Magiran, ProQuest, Medline, ScienceDirect, Web of Science, and Scopus. The main search keywords were determined through searching the Medical Subject Headings and the PubMed databases. Other keywords were determined through the literature search (Table 1).

The search protocol was not limited to any time period. Additional search strategies were also used which included literature search in Google Scholar and manual search of the reference lists of the retrieved documents.[21] The retrieved documents were assessed for eligibility criteria, namely accessible abstract and full-text, publication in peer-reviewed journals, and relevance to HPL among CRC survivors. Commentaries, conference abstracts, dissertations, and documents relevant to HPL before CRC diagnosis were not included. Eligibility assessment was collectively performed by the first and second authors. Document selection was performed through assessing their titles, abstracts, and full-texts. The literature search was reported using the four-step Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) framework (Figure 1). The four steps are record identification, record screening, eligibility assessment, and inclusion.[24]

Primary evaluation of the documents was performed based on their aims and using the following questions, "Does the document define or describe HPL among CRC survivors?" and "Does the document provide a method for promoting HPL among CRC survivors?". After that, documents were evaluated using the 2018 version of the Mixed Methods Appraisal Tool (MMAT).[20] This tool was selected due to the methodological heterogeneity of the retrieved documents. MMAT is an appropriate tool for the quality evaluation of studies with different designs and helps compare studies based on their methodologies and designs. It has two primary screening questions which reveal whether an intended study is empirical. Besides,

Table 1. Search strategy and keywords

Keywords	AND/OR	AND/OR
"Lifestyle" "Health promotion"	"Colorectal neoplasm" "Cancer survivors" "Survive" "Colorectal cancer" "Colorectal" "Rectal" "Rectum" "Colon"	"Diet" "Smoking" "Smoking cessation" "Tobacco smoking" "Cigarette smoking" "Case management" "Stress management" "Self-care" "Body mass Index" "Obesity" "Overweight" "Alcohol drinking" "Exercise" "Physical activity" "Social support"

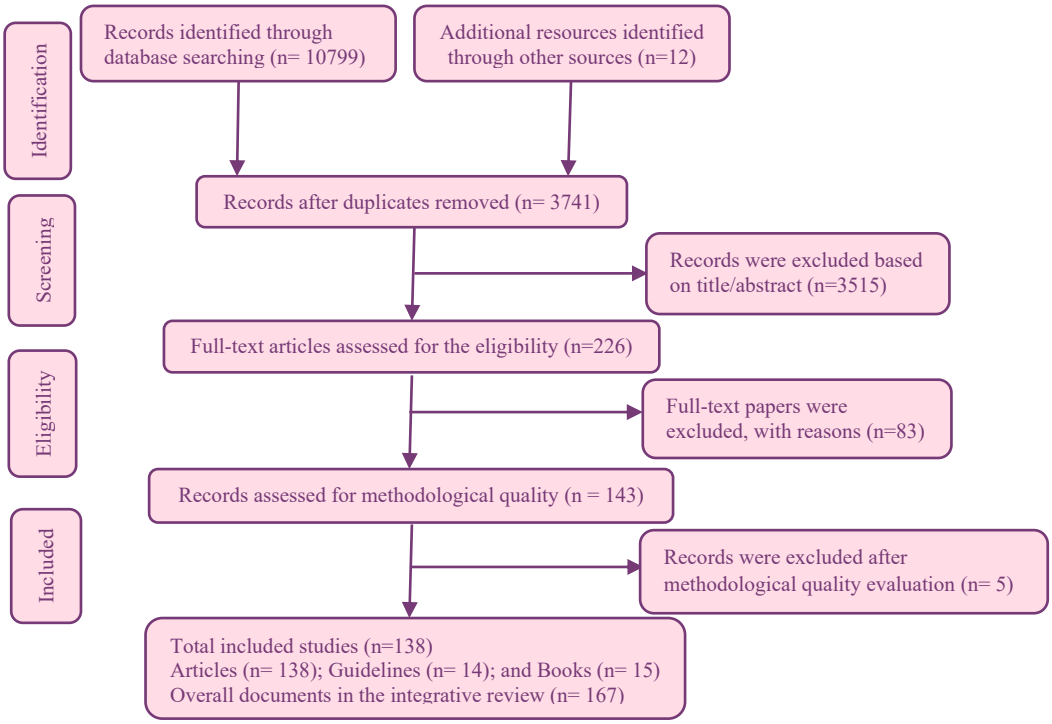

Figure 1. PRISMA diagram of literature search and document selection

MMAT includes five questions for each of the following study designs: qualitative studies, randomized controlled trials, non-randomized interventional studies, descriptive studies, and mixed methods studies. Questions are scored zero, 25%, 50%, 75%, or 100%, where higher scores show higher quality.[25] Studies with a mean score of more than 75% were included in the present study. Accordingly, five studies were excluded due to a quality score of less than 75%. Two study authors independently performed data evaluation and determined the reasons for excluding documents. Finally, all included studies were reassessed and approved by the first author.

Data analysis was performed using the four-step approach proposed by Whittemore and Knafl. The four steps of this approach are data reduction, data display, data comparison, and conclusion drawing and verification.[22,23] Initially, included documents were categorized according to their type (book, article, or guideline) and the addressed dimensions of HPL among CRC survivors. Original articles were further categorized according to their design, population, and publication year. Then, data summarization and organization were performed through extracting meaning units related to the antecedents, attributes, and consequences of HPL among CRC survivors. Extracted data were coded and categorized using the dimensions of HPL in Pender's Health Promotion Model. This model is a descriptive nursing model for the prediction of health-related behaviors. The six health-promoting behaviors in this model are health responsibility, physical activity, nutrition, spiritual growth, stress management, and interpersonal relations.[6] Extracted data were categorized into subcategories according to their similarities and then, subcategories were categorized into these six main categories. Data which did not fit these categories were categorized into new categories.

Results

The fifth and the last step of Whittemore and Knafl's method is the presentation of the results. In the literature search step, 10 811 articles, twenty books, and eighteen guidelines were retrieved which were reduced during quality evaluation to 138 articles, fifteen books, and fourteen guidelines. All these 167 documents were included in analysis (Figure 1). During data analysis, 1863 codes were generated and categorized into 88 subcategories, eighteen categories, and the three main themes of antecedents, attributes, and consequences (Table 2).

Antecedents

The antecedents of HPL among CRC survivors were categorized into thirty subcategories and the six categories of socio-demographic characteristics, clinical characteristics, psychological status, physical conditions, time and place limitations, and patient education.

Socio-demographic Characteristics

Socio-demographic characteristics can greatly affect HPL among CRC survivors. These characteristics include age, gender, and marital status, number of children, employment status, residential status, educational

Table 2. The antecedents, attributes, and consequences of HPL among CRC survivors

Categories	Subcategories
Antecedents	
Socio-demographic characteristics	Age, gender, marital status, number of children, employment status, residential status, educational level, income level, citizenship status, insurance status
Clinical characteristics	Comorbid conditions, treatment type, cancer stage, smoking, alcohol consumption, body mass index
Psychological status	Emotional well-being, psychosomatic disorders, perceived stress, anxiety, depression, relationships with partner, interest in physical exercise
Physical conditions	Physical changes, physical weakness, fatigue, physical pain, sexual health
Time and place limitations	Limited access to transportation for referring to healthcare centers, time limitation
Patient education	lack of education for lifestyle modification, healthcare providers' inattention to quality education, neglecting the unmet educational needs of survivors
Attributes	
Health responsibility	Treatment adherence, self-care
Nutrition	Appropriate dietary patterns, considerations related to macronutrients, considerations related to micronutrients, considerations for beverages
Interpersonal relations	Support from family and friends, support from healthcare providers, financial support, perceived support for returning to work
Physical activity and rest	Sleeping behaviors, immobility, physical activity
Spiritual growth	Use of personal strategies to improve spiritual health, use of social strategies to improve spiritual health, use of spiritual therapist for spiritual support
Psychological management	Management of recurrence-related fear, interventions to overcome depression, psychological considerations for a positive change in the meaning of life, use of strategies to reduce anxiety and posttraumatic stress disorder, general strategies for fatigue management
Consequences	
Improvement of prognosis	Improved prognosis, slow disease progression, reduced risk of secondary cancer, increased survival rate, reduced cancer-induced death rate, reduced overall death rate
Improvement of physical conditions	Promoted physical activity, improved physical functioning, improved function of the immune system, lower sleep disorders, lower treatment side effects, reduced gastrointestinal symptoms of irritable bowel syndrome, lower risk of cardiovascular disease, greater physical readiness, improved physical fitness, improved cardiopulmonary function, higher level of hemoglobin, lower activity-related fatigue, reduced insulin resistance, lower levels of cholesterol and low density lipoprotein, and better gastrointestinal absorption of iron, magnesium, zinc, B vitamins, folate, and alpha-tocopherol
Improvement of psychological conditions	Reduced psychological distress, better self-image, lower depression, improved self-leadership, better mental functioning, higher motivation, greater behavioral intention, greater attention to healthy life, emotional well-being
Improvement of social conditions	Improved social interactions, improved social roles and functioning
Improvement of quality of life	Higher quality of life
Improvement of general health	Improved well-being, empowerment, transcendence

level, income level, citizenship status, and insurance. Younger CRC survivors need greater support during recovery, experience higher levels of stress, and show closer adherence to regular physical activity and dietary pattern.[17,26] On the other hand, post-treatment sexual disorders and treatment side effects are more prevalent among those over sixty years.[16] Compared with men, women experience higher levels of treatment-related fatigue and are more willing to change their diet[26] and engage in regular moderate- to severe intensity physical activity.[27] Moreover, willingness to modify lifestyle is greater among CRC survivors with higher educational level,[27,28] higher income level, and better insurance status.[29,30]

Clinical Characteristics

The subcategories of this category are comorbid conditions, treatment type, CRC stage, body mass index, smoking status, and alcohol consumption. CRC survivors with comorbid conditions experience higher levels of stress and are more willing to adhere to regular physical activity and receive dietary supplements.[17,26] Moreover, those who receive multiple treatments (including chemotherapy, radiation therapy, and surgery) experience greater levels of fatigue, anxiety, and depression, while a sedentary lifestyle is associated with larger body mass index.[31] Non-smokers also have greater adherence to dietary recommendations.[26]

Physical Conditions

Physical characteristics such as physical changes, physical weakness, fatigue, sexual health, and bodily pain can affect HPL among CRC survivors. Those with changes in the body less frequently engage in regular physical activity and those with chronic pain, physical weakness, and fatigue are unwilling to make changes in their daily physical activities. A positive history of sexual activities among these patients is also associated with lower sexual disorders.[14,16]

Psychological Conditions

The subcategories of this category are depression, anxiety,

perceived stress, psychosomatic disorders, emotional well-being, quality relationships with partner, and interest in physical exercise. Psychological disorders such as anxiety, depression, and psychosomatic disorders are associated with greater need for social support and lower adherence to dietary recommendations and physical activity. On the other hand, higher emotional well-being is associated with better functional status, more active engagement in physical activity, and lower incidence of sexual disorders.[16,17]

Social Conditions

CRC survivors' HPL is largely affected by limited access to transportation for referring to healthcare centers and limited amount of time for engagement in physical exercise and adherence to dietary regimen.[28,32]

Patient Education

Patient education can also affect HPL among CRC survivors. The subcategories of this category are lack of appropriate recommendations for weight control and lifestyle modification, healthcare providers' inattention to the delivery of quality education about dietary modifications, and unfulfilled educational needs of patients.[17,33]

Attributes

The attributes of HPL among CRC survivors were categorized into twenty subcategories and six main categories, namely health responsibility, physical activity, nutrition, spiritual growth, psychological management, and interpersonal relations.

Health Responsibility

Health responsibility among CRC survivors refers to personal responsibility towards treatment adherence and self-care. Personal responsibility towards treatment adherence is characterized by close attention to treatments, medications, complication management, and symptom management. Personal responsibility towards self-care also includes measures such as health maintenance, health information acquisition, use of complementary and alternative medicine, avoidance from high-risk behaviors, and effective weight control. These measures are effective in health promotion.[10,29] Health responsibility brings individuals positive feelings, improves their coping abilities, improves their functioning, and stabilizes their healthy behaviors.[6]

Nutrition

Nutrition among CRC survivors includes adherence to appropriate dietary patterns and the intake of both macro- and micro-nutrients. CRC survivors should choose healthy foodstuff and adopt healthy eating habits such as avoidance from the intake of fried, smoked, and roasted foods,[15] limited intake of red meat products, intake of appropriate meals at appropriate time points,[10,18] and adequate intake of fruits and vegetables,[19,34] high-fiber foods,[19] whole grains,[29,30,34] and dietary supplements like vitamins and minerals.[14,35]

Rest and Physical Activity

This category includes sleep-related considerations, management of sedentary behaviors, and engagement in physical activity. In order to have a quality sleep and physical activity, CRC survivors need to reduce the level of their immobility[9,36] and pay close attention to their sleep schedule, sleep quality,[14,37] and physical activity type, intensity, amount, and quality.[29] Accurate management of rest and sleep facilitates the effective use of energy, helps have a healthy life, and improves the functions of the cardiovascular, digestive, and immune systems.[5,10]

Interpersonal Relations

Interpersonal relations among CRC survivors are established through creating sources for interaction, information exchange, feeling exchange, social support, financial support, and support for returning back to work. Healthy interpersonal relations in personal, occupational, and social environments encourage CRC survivors for doing their personal tasks, improve their satisfaction, and provide them with comfort.[29,30,33]

Spiritual Growth

Spiritual growth refers to the development of spiritual capacities through using personal and collective strategies and spiritual therapists in order to improve spiritual health. Personal and collective strategies for spiritual health improvement include attending spiritual classes, sharing experience with patients suffering from CRC, attendance in self-awareness, yoga, and meditation classes, and encouragement to express anger over cancer and its complications. Spiritual therapists can also improve spiritual health among CRC survivors through discussing values, beliefs, and meaning in life and talking about senses of guilt and fear over death.[30,38] With spiritual growth, individuals learn how to experience love, peace, and development and how to help themselves and others achieve perfection and self-actualization.[6]

Psychological Management

Psychological management among CRC survivors is achieved through managing depression and fear of recurrence, positive changes in the meaning of life, and use of strategies for managing fatigue and posttraumatic stress disorder. Strategies for managing the psychological complications of CRC help CRC survivors more effectively cope with their conditions and have a more fruitful personal and social life.[29,30,32,38]

Consequences

The Consequences of HPL among CRC survivors were

categorized into 38 subcategories and the six categories of improvement in prognosis, physical conditions, psychological conditions, social conditions, quality of life, and general health.

Improvement of Disease Prognosis

Improvement of disease prognosis is one of the positive outcomes of HPL which includes reduced overall death rate, reduced cancer-induced death rate, lower risk of recurrence, improved survival rate, and complete cancer eradication.[39,40]

Improvement of Physical Conditions

HPL improves physical health status through reducing the side effects of treatments, alleviating sleep problems, improving the function of the immune system,[30] improving physical functioning,[41] promoting physical activity,[42] alleviating gastrointestinal symptoms,[32] improving cardiovascular function,[41] and alleviating activity-induced fatigue.[32,35]

Improvement of Psychological Conditions

HPL among CRC survivors improves psychological status through alleviating depression and improving self-management and self-leadership, motivation, self-image, and emotional well-being.[10,33]

Improvement of Social Conditions

The other positive outcomes of HPL among CRC survivors include better social interactions, better social functioning and identity.[29,30,41]

Improvement of Quality of Life

Higher quality of life and improving the quality of life related to health is one of the positive consequences of HPL among CRC survivors. [29,30,41]

Improvement of General Health

It is a fact that lifestyle affects general health and other aspects of life. In other words, health promotion activities are strategies to maintain health, and health promotion lifestyle preserves and improves the level of well-being, empowerment, and transcendence. [6,28,30,31]

Discussion

This integrative review sought to define the concept of HPL among CRC survivors based on the existing literature. Findings revealed that the six main attributes of this concept were health responsibility, physical activity, nutrition, spiritual growth, psychological management, and interpersonal relations and its six main antecedents were socio-demographic characteristics, clinical characteristics, psychological status, physical conditions, time and place limitations, and patient education.

One of the main attributes of HPL among CRC survivors is health responsibility which includes treatment adherence and self-care. Previous studies recommended periodical physical examinations, carcinoembryonic antigen testing, colonoscopy, computerized tomography, and screening for secondary cancers.[14,15,29] Our findings revealed that masculinity, old age, and low educational level are associated with lower adherence to treatments among CRC survivors.[29,33] Therefore, need-based education should be provided to these survivors, their families, and their family caregivers. Moreover, findings showed that health responsibility improves disease prognosis,[39,40,42] reduces the likelihood of recurrence, increases survival rate, and improves quality of life.[17,18,40-42] A study reported that compared with CRC survivors who referred to oncology specialists, those who referred to general physicians were three times more likely to experience cancer-related complications and did not refer to healthcare providers for the second time to analyze the results of their laboratory tests.[17,42] This highlights the importance of providing these patients and their families with quality education in order to encourage their engagement in self-care and promote their communication with healthcare providers[27]; otherwise, they may seek health information from unreliable sources which may result in the acquisition of misleading and contradictory information about healthy eating, physical activity, and self-care, delayed recovery, and disease recurrence.[39] Respecting alcohol consumption, some studies reported no significant relationship between alcohol consumption and overall and CRC-related death rates,[40,43] while some studies recommended alcohol abstinence effective in preventing CRC recurrence.[30,40]

Smoking in CRC survivors increases the risk of cardiovascular disease, respiratory disease, lung cancer, CRC mortality, and overall mortality. Smoking causes genetic changes and mutations in certain molecular phenotypes such as BRAF mutations and increases Microsatellite Instability (MSI) and CpG Island Methylator Phenotype (CIMP) levels, which affect the rate of metastatic and invasive tumors, and therefore smokers have a lower chance of survival.[44,45] Effective weight management is another main component of health responsibility among CRC survivors. However, a study showed that overweight and obesity among male CRC survivors had no significant relationship with survival rate and disease recurrence.[42] Effective weight management is multifactorial and is affected by factors such as healthy diet, adherence to nutritional recommendations, regular daily physical activity, and adequate sleep.[16,17,42]

Nutrition, the second main attribute of HPL among CRC survivors, greatly focuses on restricting the intake of red meat and its products[18] in order to prevent disease recurrence and achieve complete recovery.[40] However, a study reported that restricted intake of red meat had no significant effects on survival, cardiovascular disease risk and prevalence, and disease recurrence during the first five years after recovery from CRC.[46] Consumption of

one gram of processed meat versus consumption of one gram of fresh red meat increases the risk of recurrence of colon cancer by 2-11 times.[47] This contradiction is due to the effects of the quality and the quantity of red meat intake on its outcomes. Digestion of red meat in the gastrointestinal tract increases the level of nitrosamines and aromatic amines, which causes over proliferation of intestinal epithelial tissue and more cytotoxicity with the presence of fecal matter in the intestines. Generally, the diet of CRC survivors should be rich in fresh fruit and vegetables and unrefined whole grains with limited sugar, sodium, fast foods, and high-fat foods.[30,34] Consumption of dietary fiber such as whole grains, vegetables, and fruits reduces the recurrence of colon adenomas and mortality in CRC patients.[48] It is hypothesized that consuming more fiber in CRC survivors without an intestinal ostomy, leads to an increase the volume of fecal mass, accelerates bowel movements, and thus reduces the time of exposure to carcinogens in the intestines.[49]

Our findings also showed greater adherence to dietary regimen among female and young CRC survivors and those with comorbid conditions.[26,50] CRC survivors with higher income level, better employment status, and no psychological problems are also more likely to seek information about dietary modifications.[17,34] Psychological, social, and financial factors should be taken into account when developing dietary plans and providing dietary recommendations for CRC survivors who have limited adherence. Moreover, those with social and financial problems should be provided with in-person, telephone-based, and online follow-up services and financial support.

The third main attribute of HPL among CRC survivors is rest and physical activity. Physical activity includes recreational physical exercise, physical activity at home, and professional physical exercise. Physical exercise should be performed 60–300 minutes per week[30,40] and should be so intense that heart rate reaches 55%–77% of its maximum predicted value.[31] Regular daily physical activity reduces treatment side effects,[32] alleviates sleep disorders, improves the function of the immunity system,[30] and improves physical functioning.[10,41]

Taking a nap for more than 2 hours during the day has increased overall mortality and the risk of cardiovascular disease.[36] Also, sleeping less than 5 hours a day before and after the disease can increase the overall mortality rate by 36% and the cancer mortality rate by 54%.[37] Having a regular bedtime routine and following recommendations such as regular exercise during the day, not eating heavy meals before bed, not using electronic devices such as cell phones or TVs before bed are effective in maintaining sleep hygiene.[29,30]

Inactive activities such as prolonged sitting and lying down, watching TV, and working with computers and digital devices can lead to obesity, cancer progression and mortality.[36,51] Prolonged inactivity increases adiposity, metabolic disorders, increased inflammatory responses, and decreased absorption of vitamin D and calcium.[51,52] The barriers to engagement in physical activity among CRC survivors include physiological barriers (such as age, gender, and obesity), time and place limitations, psychological barriers (such as fatigue and anxiety), and limited professional support.[41] Therefore, healthcare providers should take into account these barriers and the unique physical, mental, and psychological needs of each individual when they provide recommendations about lifestyle modification and physical activity.

Another attribute of HPL among CRC survivors is interpersonal relations. Support by family, friends, caregivers, healthcare providers, and colleagues improves CRC survivors' social interactions, social functioning, social role performance, emotional well-being, motivation, and quality of life.[30,33,36,41] Patient support for returning to work includes physical examination to assess the ability to return to work, psychological counseling, healthcare providers' recommendations and encouragement, modifications in occupational tasks and responsibilities, and emotional support by colleagues.[29,30] A study showed that most CRC survivors, particularly those who were younger, had no partner, had comorbid conditions, and needed support for modifying their lifestyle.[53]

The most important role of friends and family is encouraging survivors to perform sports programs and make changes in dietary patterns. This can increase self-efficacy, improve self-leadership, lower perceived barriers for performing and maintaining exercise and dietary changes.[29,53] Also, the healthcare providers can improve intra-family communication, reduce stress and the caregiver support burden by effectively providing informational and emotional support to the family and caregivers.[50] CRC survivors spend most of their time with family members, talking to them during difficult times in life, and seeking their opinions during difficult times. Therefore, having a supportive family for these patients is important during treatment and follow-up.

Spiritual growth is the fifth main category of HPL among CRC survivors. Helping CRC survivors develop their spiritual abilities and capacities can reduce their psychological distress[41,54] and improve their behavioral intention, self-image, quality of life, and general health.[30,31,41] Compared with other patients, CRC survivors have greater spiritual needs such as the need for relationship with a supreme being, positivism, acknowledgement, hope, love, meaning and purpose in life, and readiness for death. Consultation with clergies and attendance in group therapy sessions and use of spiritual strategies can fulfill most of these needs and prevent sense of guilt, loss of faith, frustration, aggression, shame, and disturbances in the meaning of life.[29,30]

Spirituality strategies can improve coping with cancer, treatment adherence, spiritual well-being, and quality of life and reduce distress in cancer survivors.[30] the literature

review also suggested spiritual strategies such as the compassionate presence of the healthcare providers, life review, listening to the patient's story, open-ended questions to illicit feelings, referral to a trained spiritual care professional, dignity-conserving therapy, progressive relaxation or guided imagery, meaning therapy, attending spiritual support groups, meditation, prayer therapy, massage, yoga, tai chi, art therapy (music, art, dance), journalism (writing).[55,56] However, the importance of providing these strategies and the capacity to support this in clinical practice is neglected. Healthcare providers are advised to consider the importance of spiritual and religious beliefs and strategies in clinical practice regardless of their own beliefs.[57]

The last attribute of HPL among CRC survivors is psychological management. These survivors feel fear over disease recurrence, anxiety due to posttraumatic stress disorder, depression, and fatigue due to psychological strains. Inattention to these problems can aggravate symptoms such as depression, anxiety, pain, and sleeplessness and negatively affect physical, cognitive, emotional, and social functioning, quality of life, functional roles, and level of physical activity.[33,54] Psychological problems are more prevalent among those who have more than one child, have comorbid conditions,[30] are single,[28] and have received multiple treatments such as surgery, chemotherapy, and radiation therapy.[31] Effective management of CRC survivor's psychological problems improves their quality of life,[17,41] alleviates their problems in maintaining their personal and occupational roles and interpersonal relationships,[29] and improves their motivation and self-management.[41,55]

Potentially relevant documents and articles on HPL in survivors of CRC were more than expected, However, a large number of appropriate sources were included in the study after careful the qualitative methodological appraisal. The publication of English documents more than other languages caused gray literature and publications in languages other than English are not included in this study, which may be a possible source of publication bias.

Conclusion

Based on the findings of the present study, HPL among CRC survivors is defined as "a set of behaviors in the health responsibility, physical activity, nutrition, spiritual growth, psychological management, and interpersonal relations areas which are affected by socio-demographic characteristics, clinical characteristics, psychological status, physical conditions, time and place limitations, and patient education, and lead to better disease prognosis, better general health status, better bio-psycho-social status, and better quality of life". Healthcare authorities and providers, particularly nurses, can use this definition to develop plans for providing CRC survivors with counseling, educational, supportive, and care services and thereby, improve their quality of life and survival.

Acknowledgements

We are very grateful for the Research and Technology Administration of Mashhad University of Medical Sciences for financial support.

Authors' Contribution

Conceptualization: Elahe Ramezanzade Tabriz, Monir Ramezani, Abbas Heydari, Seyed Amir Aledavood.
Data curation: Elahe Ramezanzade Tabriz, Monir Ramezani.
Formal analysis: Elahe Ramezanzade Tabriz, Monir Ramezani.
Investigation: Elahe Ramezanzade Tabriz, Monir Ramezani.
Methodology: Elahe Ramezanzade Tabriz, Monir Ramezani, Abbas Heydari, Seyed Amir Aledavood.
Project administration: Monir Ramezani.
Supervision: Monir Ramezani, Abbas Heydari.
Validation: Monir Ramezani, Abbas Heydari.
Visualization: Monir Ramezani, Abbas Heydari, Seyed Amir Aledavood.
Writing–original draft: Elahe Ramezanzade Tabriz.
Writing–review & editing: Monir Ramezani, Abbas Heydari, Seyed Amir Aledavood.

Competing Interests

The authors declare no conflict of interest in this study.

Data Availability

The data that support the findings of this study are available from the corresponding author (MR), upon reasonable request.

Ethical Approval

The Ethics Committee of Mashhad University of Medical Sciences approved this study (Code: IR.MUMS.REC.1398.148). All steps of the study, including literature search, keyword selection, and database selection, were cross-checked by coauthors. Data evaluation was independently performed by two authors and approved by another author. Moreover, data evaluation was performed anonymously, i.e., without knowing the name(s) and the affiliation(s) of their author(s). Prolonged engagement with the data was employed to

Research Highlights

What is the current knowledge?

- HPL is defined as a process of enabling people to improve their health or activities.
- Applying HPL can people directed toward increasing their well-being, self-actualization, and self-satisfaction.

What is new here?

- HPL among CRC survivors is multidimensional and includes nutrition, activity and rest, health responsibility, interpersonal relations, spiritual growth, and psychological management.
- Consequences HPL in CRC survivors leads to better disease prognosis, better general health status, better bio-psycho-social status, and better quality of life.
- Identifying the components of HPL in CRC survivors can help healthcare providers design and provide care, treatment, education, and counseling services in a purposive and desirable manner.

ensure the credibility of the data. Data extraction and analysis were also supervised and approved by coauthors.

Funding

The research was financially supported by the Research and Technology Administration of Mashhad University of Medical Sciences, Mashhad, Iran.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021; 71(3): 209-49. doi: 10.3322/caac.21660
2. Rawla P, Sunkara T, Barsouk A. Epidemiology of colorectal cancer: incidence, mortality, survival, and risk factors. Prz Gastroenterol. 2019; 14(2): 89-103. doi: 10.5114/pg.2018.81072
3. Molavi Vardanjani H, Haghdoost A, Bagheri-Lankarani K, Hadipour M. Estimation and projection of prevalence of colorectal cancer in Iran, 2015-2020. Adv Biomed Res. 2018; 7: 20. doi: 10.4103/abr.abr_178_16
4. Demark-Wahnefried W, Jones LW. Promoting a healthy lifestyle among cancer survivors. Hematol Oncol Clin North Am. 2008; 22(2): 319-42. doi: 10.1016/j.hoc.2008.01.012
5. Vijayvergia N, Denlinger CS. Lifestyle factors in cancer survivorship: where we are and where we are headed. J Pers Med. 2015; 5(3): 243-63. doi: 10.3390/jpm5030243
6. Pender NJ, Murdaugh CL, Parsons MA. Health promotion in nursing practice. 7th ed. Upper Saddle River, NJ: Pearson; 2014. p. 1-20.
7. Hardcastle SJ, Maxwell-Smith C, Zeps N, Platell C, O'Connor M, Hagger MS. A qualitative study exploring health perceptions and factors influencing participation in health behaviors in colorectal cancer survivors. Psychooncology. 2017; 26(2): 199-205. doi: 10.1002/pon.4111
8. Blum D, Omlin A, Baracos VE, Solheim TS, Tan BH, Stone P, et al. Cancer cachexia: a systematic literature review of items and domains associated with involuntary weight loss in cancer. Crit Rev Oncol Hematol. 2011; 80(1): 114-44. doi: 10.1016/j.critrevonc.2010.10.004
9. Jafri SH, Mills G. Lifestyle modification in colorectal cancer patients: an integrative oncology approach. Future Oncol. 2013; 9(2): 207-18. doi: 10.2217/fon.12.184
10. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines). Survivorship Version. Plymouth Meeting, Pennsylvania: NCCN; 2021. p. 52-6.
11. Pekmezi DW, Demark-Wahnefried W. Updated evidence in support of diet and exercise interventions in cancer survivors. Acta Oncol. 2011; 50(2): 167-78. doi: 10.3109/0284186x.2010.529822
12. Ramezanzade Tabriz E, Ramezani M, Heydari A, Aledavood SA. Health-promoting lifestyle in colorectal cancer survivors: a qualitative study on the experiences and perspectives of colorectal cancer survivors and healthcare providers. Asia Pac J Oncol Nurs. 2021; 8(6): 696-710. doi: 10.4103/apjon.apjon-2132
13. World Health Organization (WHO). WHO List of Priority Medical Devices for Cancer Management. Geneva: WHO; 2017.
14. El-Shami K, Oeffinger KC, Erb NL, Willis A, Bretsch JK, Pratt-Chapman ML, et al. American Cancer Society colorectal cancer survivorship care guidelines. CA Cancer J Clin. 2015; 65(6): 428-55. doi: 10.3322/caac.21286
15. Meyerhardt JA, Mangu PB, Flynn PJ, Korde L, Loprinzi CL, Minsky BD, et al. Follow-up care, surveillance protocol, and secondary prevention measures for survivors of colorectal cancer: American Society of Clinical Oncology clinical practice guideline endorsement. J Clin Oncol. 2013; 31(35): 4465-70. doi: 10.1200/jco.2013.50.7442
16. Lynch BM, van Roekel EH, Vallance JK. Physical activity and quality of life after colorectal cancer: overview of evidence and future directions. Expert Rev Qual Life Cancer Care. 2016; 1(1): 9-23. doi: 10.1080/23809000.2016.1129902
17. Van Blarigan EL, Fuchs CS, Niedzwiecki D, Zhang S, Saltz LB, Mayer RJ, et al. Association of survival with adherence to the American Cancer Society nutrition and physical activity guidelines for cancer survivors after colon cancer diagnosis: the CALGB 89803/Alliance trial. JAMA Oncol. 2018; 4(6): 783-90. doi: 10.1001/jamaoncol.2018.0126
18. Van Blarigan EL, Meyerhardt JA. Role of physical activity and diet after colorectal cancer diagnosis. J Clin Oncol. 2015; 33(16): 1825-34. doi: 10.1200/jco.2014.59.7799
19. Lee CF, Ho JWC, Fong DYT, Macfarlane DJ, Cerin E, Lee AM, et al. Dietary and physical activity interventions for colorectal cancer survivors: a randomized controlled trial. Sci Rep. 2018; 8(1): 5731. doi: 10.1038/s41598-018-24042-6
20. Pluye P, Gagnon MP, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in mixed studies reviews. Int J Nurs Stud. 2009; 46(4): 529-46. doi: 10.1016/j.ijnurstu.2009.01.009
21. Whittemore R, Knafl K. The integrative review: updated methodology. J Adv Nurs. 2005; 52(5): 546-53. doi: 10.1111/j.1365-2648.2005.03621.x
22. Whittemore R. Combining evidence in nursing research: methods and implications. Nurs Res. 2005; 54(1): 56-62. doi: 10.1097/00006199-200501000-00008
23. Whittemore R. Analysis of integration in nursing science and practice. J Nurs Scholarsh. 2005; 37(3): 261-7. doi: 10.1111/j.1547-5069.2005.00045.x
24. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med. 2009; 151(4): 264-9. doi: 10.7326/0003-4819-151-4-200908180-00135
25. Hong QN, Gonzalez-Reyes A, Pluye P. Improving the usefulness of a tool for appraising the quality of qualitative, quantitative and mixed methods studies, the Mixed Methods Appraisal Tool (MMAT). J Eval Clin Pract. 2018; 24(3): 459-67. doi: 10.1111/jep.12884
26. Bours MJ, Beijer S, Winkels RM, van Duijnhoven FJ, Mols F, Breedveld-Peters JJ, et al. Dietary changes and dietary supplement use, and underlying motives for these habits reported by colorectal cancer survivors of the Patient Reported Outcomes Following Initial Treatment and Long-Term Evaluation of Survivorship (PROFILES) registry. Br J Nutr. 2015; 114(2): 286-96. doi: 10.1017/s00071145150017798
27. Eyl RE, Xie K, Koch-Gallenkamp L, Brenner H, Arndt V. Quality of life and physical activity in long-term (≥5 years post-diagnosis) colorectal cancer survivors - systematic review. Health Qual Life Outcomes. 2018; 16(1): 112. doi: 10.1186/s12955-018-0934-7
28. Fisher A, Wardle J, Beeken RJ, Croker H, Williams K, Grimmett C. Perceived barriers and benefits to physical activity in colorectal cancer patients. Support Care Cancer. 2016; 24(2): 903-10. doi: 10.1007/s00520-015-2860-0
29. Libutti SK, Saltz LB, Willett CG, Levine RA. Cancer of the colon. In: DeVita VT Jr, Hellman S, Rosenberg SA, eds. DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology. 12th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2021.
30. Rodriguez MA, Foxhall LE. Handbook of Cancer Survivorship Care. New York: Springer Publishing Company; 2018.

31. Vissers PAJ, Martucci RB, Mols F, Bours MJL, Winkels RM, Kampman E, et al. The impact of body mass index and waist circumference on health-related quality of life among colorectal cancer survivors: results from the PROFILES registry. Nutr Cancer. 2017; 69(8): 1177-84. doi: 10.1080/01635581.2017.1367938
32. Devin JL, Sax AT, Hughes GI, Jenkins DG, Aitken JF, Chambers SK, et al. The influence of high-intensity compared with moderate-intensity exercise training on cardiorespiratory fitness and body composition in colorectal cancer survivors: a randomised controlled trial. J Cancer Surviv. 2016; 10(3): 467-79. doi: 10.1007/s11764-015-0490-7
33. Hardcastle SJ, Maxwell-Smith C, Hagger MS, O'Connor M, Platell C. Exploration of information and support needs in relation to health concerns, diet and physical activity in colorectal cancer survivors. Eur J Cancer Care (Engl). 2018; 27(1). doi: 10.1111/ecc.12679
34. Shaffer KM, Kim Y, Llabre MM, Carver CS. Dyadic associations between cancer-related stress and fruit and vegetable consumption among colorectal cancer patients and their family caregivers. J Behav Med. 2016; 39(1): 75-84. doi: 10.1007/s10865-015-9665-y
35. Koole JL, Bours MJL, Breedveld-Peters JJL, van Roekel EH, Breukink SO, Janssen-Heijnen MLG, et al. Is dietary supplement use longitudinally associated with fatigue in stage I-III colorectal cancer survivors? Clin Nutr. 2020; 39(1): 234-41. doi: 10.1016/j.clnu.2018.12.037
36. Ratjen I, Schafmayer C, di Giuseppe R, Waniek S, Plachta-Danielzik S, Koch M, et al. Postdiagnostic physical activity, sleep duration, and TV watching and all-cause mortality among long-term colorectal cancer survivors: a prospective cohort study. BMC Cancer. 2017; 17(1): 701. doi: 10.1186/s12885-017-3697-3
37. Xiao Q, Arem H, Pfeiffer R, Matthews C. Prediagnosis sleep duration, napping, and mortality among colorectal cancer survivors in a large US cohort. Sleep. 2017; 40(4): zsx010. doi: 10.1093/sleep/zsx010
38. Hopewood P, Milroy MJ. Quality Cancer Care: Survivorship Before, During and After Treatment. Springer; 2018.
39. Escudero Paniagua B, Aguilar-Martínez A, Keenoy BM. [Nutritionally modifiable prognostic biomarkers in colorectal cancer survivors after diagnosis]. Nutr Hosp. 2017; 34(1): 235-43. doi: 10.20960/nh.1000
40. Jayasekara H, English DR, Haydon A, Hodge AM, Lynch BM, Rosty C, et al. Associations of alcohol intake, smoking, physical activity and obesity with survival following colorectal cancer diagnosis by stage, anatomic site and tumor molecular subtype. Int J Cancer. 2018; 142(2): 238-50. doi: 10.1002/ijc.31049
41. Chen Q, Xun P, Tsinovoi CL, Henschel B, Fly AD, He K. Association of herbal/botanic supplement use with quality of life, recurrence, and survival in newly diagnosed stage II colon cancer patients: a 2-y follow-up study. Nutrition. 2018; 54: 1-6. doi: 10.1016/j.nut.2018.02.002
42. Lee J, Jeon JY, Meyerhardt JA. Diet and lifestyle in survivors of colorectal cancer. Hematol Oncol Clin North Am. 2015; 29(1): 1-27. doi: 10.1016/j.hoc.2014.09.005
43. Yang B, Gapstur SM, Newton CC, Jacobs EJ, Campbell PT. Alcohol intake and mortality among survivors of colorectal cancer: the Cancer Prevention Study II nutrition cohort. Cancer. 2017; 123(11): 2006-13. doi: 10.1002/cncr.30556
44. Yang B, Jacobs EJ, Gapstur SM, Stevens V, Campbell PT. Active smoking and mortality among colorectal cancer survivors: the Cancer Prevention Study II nutrition cohort. J Clin Oncol. 2015; 33(8): 885-93. doi: 10.1200/jco.2014.58.3831
45. Walter V, Jansen L, Hoffmeister M, Brenner H. Smoking and survival of colorectal cancer patients: systematic review and meta-analysis. Ann Oncol. 2014; 25(8): 1517-25. doi: 10.1093/annonc/mdu040
46. Carr PR, Jansen L, Walter V, Kloor M, Roth W, Bläker H, et al. Associations of red and processed meat with survival after colorectal cancer and differences according to timing of dietary assessment. Am J Clin Nutr. 2016; 103(1): 192-200. doi: 10.3945/ajcn.115.121145
47. Lofano K, Principi M, Scavo MP, Pricci M, Ierardi E, Di Leo A. Dietary lifestyle and colorectal cancer onset, recurrence, and survival: myth or reality? J Gastrointest Cancer. 2013; 44(1): 1-11. doi: 10.1007/s12029-012-9425-y
48. Yao Y, Suo T, Andersson R, Cao Y, Wang C, Lu J, et al. Dietary fibre for the prevention of recurrent colorectal adenomas and carcinomas. Cochrane Database Syst Rev. 2017; 1(1): CD003430. doi: 10.1002/14651858.CD003430.pub2
49. Fernández-Villa T, Álvarez-Álvarez L, Rubín-García M, Obón-Santacana M, Moreno V. The role of dietary patterns in colorectal cancer: a 2019 update. Expert Rev Gastroenterol Hepatol. 2020; 14(4): 281-90. doi: 10.1080/17474124.2020.1736043
50. Lee MK, Park SY, Choi GS. Association of support from family and friends with self-leadership for making long-term lifestyle changes in patients with colorectal cancer. Eur J Cancer Care (Engl). 2018; 27(3): e12846. doi: 10.1111/ecc.12846
51. Lynch BM. Sedentary behavior and cancer: a systematic review of the literature and proposed biological mechanisms. Cancer Epidemiol Biomarkers Prev. 2010; 19(11): 2691-709. doi: 10.1158/1055-9965.epi-10-0815
52. Lynch BM, Cerin E, Owen N, Hawkes AL, Aitken JF. Television viewing time of colorectal cancer survivors is associated prospectively with quality of life. Cancer Causes Control. 2011; 22(8): 1111-20. doi: 10.1007/s10552-011-9786-8
53. Hoedjes M, de Kruif A, Mols F, Bours M, Beijer S, Winkels R, et al. An exploration of needs and preferences for dietary support in colorectal cancer survivors: a mixed-methods study. PLoS One. 2017; 12(12): e0189178. doi: 10.1371/journal.pone.0189178
54. Hoon LS, Chi Sally CW, Hong-Gu H. Effect of psychosocial interventions on outcomes of patients with colorectal cancer: a review of the literature. Eur J Oncol Nurs. 2013; 17(6): 883-91. doi: 10.1016/j.ejon.2013.05.001
55. Puchalski CM, Sbrana A, Ferrell B, Jafari N, King S, Balboni T, et al. Interprofessional spiritual care in oncology: a literature review. ESMO Open. 2019; 4(1): e000465. doi: 10.1136/esmoopen-2018-000465
56. Ripamonti CI, Giuntoli F, Gonella S, Miccinesi G. Spiritual care in cancer patients: a need or an option? Curr Opin Oncol. 2018; 30(4): 212-8. doi: 10.1097/cco.0000000000000454
57. Ghorbani M, Mohammadi E, Aghabozorgi R, Ramezani M. Spiritual care interventions in nursing: an integrative literature review. Support Care Cancer. 2021; 29(3): 1165-81. doi: 10.1007/s00520-020-05747-9