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Dietary Prevention of Colorectal Cancer

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Abstract

Colorectal Cancer (CRC) is the third leading cause of cancer death in Ireland yet it is a highly preventable disease through lifestyle factors such as diet and exercise. Vast amounts of research have been conducted supporting the hypothesis that diet helps to prevent or significantly reduce the incidence of CRC. However, very little is known as to whether any health promotion activities are being adopted practice nurses to raise public awareness of the primary prevention of CRC. A proposed method will be set out to explore Irish practice nurses knowledge on the primary prevention of CRC. A purposive sample obtained from the Irish Practice Nurses Association (IPNA) will be used in this quantitative study. Questionnaires will be used for data collection. It is anticipated that the knowledge gained from this study will improve practice nurses and other health care professionals understanding, awareness and necessity of increasing the public awareness about the primary prevention of CRC.

Keywords: Colorectal cancer; Diet and exercise

Introduction

Colorectal cancer (CRC), which is cancer of the colon or rectum, is one of the most major causes of morbidity and mortality in the developed world and is the second most common cause of cancer related death with approximately 50% of the incidence resulting in death [1]. In Ireland, CRC is the third leading cause in cancer death in both men and women, with approximately half of the incidence rate resulting in mortality [2]. Ireland also has the highest level of mortality amongst neighbouring countries in Northern and Western Europe [3]. Yet this is one of the only cancers which can be completely prevented and even cured if it is detected early enough [4]. Evidently, this is a serious public health problem in which awareness needs to be raised. Most individuals are asymptomatic for a long time and do not seek the necessary medical treatment until they have obvious symptoms such as changes in bowel habit or rectal bleeding [5].Therefore, nurses could play a key role in CRC Prevention by educating the public so to increase awareness. Primary prevention has the potential to reduce the incidence of CRC [6]. Although health promotion is a widely featured topic within nursing today, relatively little evidence exists about the promotion of the primary prevention of CRC. Current evidence on the subject will be thoroughly reviewed in hope to address future recommendations concerning nursing practice. Subsequently, a proposal for research to be conducted on an un-researched aspect of the topic will be made. The increasing public health concern of CRC and the vital role a nurse can play in primary prevention through health promotion education prompted the choice of this specific topic. Therefore, areas which will be looked at include risk factors associated with the increased/decreased incidence of CRC with particular emphasis on diet, screening for CRC, the role of the nurse in health promotion and in the primary prevention of CRC. A brief insight into CRC, those susceptible, detection, tumour staging and treatment will be provided to give the reader more of an understanding of the disease.

Search strategy

A planned literature search strategy can save one time and immensely improve the quality of the search. For this, a focused search question is necessary. The more focused a question, the more precise and accurate the search will be [7]. Literature was accessed using the Cochrane Library, CINAHL, PUBMED, Science Direct, OVID, SAGE databases and by manual searches in libraries. It includes research-based articles, journals, literature reviews and relevant research texts. Keywords and limiters included: cancer, diet, fibre, fat, meat, processed meat, carbohydrate, fish, genetics, age, nutrition, colorectal, bowel, colon, prevention, screening, health promotion, empowerment, primary care, public health nurses, epidemiology, risk, prevention. The majority of the research was undertaken in the U.K., the U.S.A. with supportive literature from Europe from 1995-2008. Research from Ireland was scant.

Background

Most CRCs evolve from abnormal masses of tissue known as polyps which grow on the inner lining of the colon or rectum. The development of CRC is a lengthy process as polyps can take years before they become cancerous [8]. Clinical features of CRC include changes in bowel habit, rectal bleeding, and symptom less Anaemia, colicky pain, fatigue, anorexia, and weight loss and also sometimes there may be a bowel obstruction [9].

Detection

Early detection is vital as a late diagnosis usually results in a poor survival rate and studies have shown that early detection leads to higher survival rates [10,11]. Currently, there is no gold standard for the detection of CRC. Commonly used modes of detection include an annual guaiac faecal occult blood test (gFOBT), a flexible sigmoidoscopy every 5 years (with or without gFOBT), a double-contrast barium enema every 5 years and colonoscopy every 10 years [12].

Tumour staging

Once a diagnosis is made, the prognosis depends on how far the cancer has spread. The "Dukes System" is a type of cancer staging system which is commonly used to estimate the severity of CRC. It was first established by Dr. Dukes CE [13]. There are four stages within the system known as Dukes A, B, C and D [13]. The earliest stage of CRC can be defined as Dukes a tumour. Statistic's state that over 90% of patients will still be alive 5 years after a surgical resection Dukes a tumour [11]. Research reflects a poor prognosis and an even poorer survival rate for Dukes C and Dukes D. Majority of CRC cases are only detected at this stage [14]. This may be due to lack of awareness of signs and symptoms of CRC.

Treatment

Treatment for CRC depends on the stage of the tumour, how far it has spread and of course factors regarding the patient's health status. Also, the success of treatment depends on the how far the tumour has advanced. Treatment options include surgery, radiotherapy or chemotherapy. Traditionally, surgery and radiotherapy are used together [15]. Surgery is the most common method of treatment in Ireland with approximately 91% of patients opting for this choice. Chemotherapy is less common with approximately 43% of patients opting for this choice. Finally, radiotherapy is the least common of all treatment option for CRC [16].While curative therapies have seen recent advancements, there has only been a slight improvement in survival for patients who present with advanced CRC [17]. Therefore, this further supports the concept that nurses may play a key role in the prevention of CRC through raising public awareness of modifiable risk factors and screening for CRC.

Risk Factors Associated with CRC

Vast amounts of literature exist on extrinsic and intrinsic risk factors associated with CRC. Age, genetics and lifestyle factors such as diet and body fatness were all included [18]. As this literature review is chiefly concerned with exploring primary prevention, a larger focus will remain on various aspects of the diet.

Non-modifiable risk factors associated with CRC

Age: Increasing age has been closely linked with CRC incidence beginning at the age of forty with a dramatic increase from the age of fifty onwards. People most susceptible to developing CRC include both men and women over the age of fifty and this population are also more likely to die from CRC [14,18-22]. Despite this, research has suggested the increase of CRC in younger age groups [21,23,24]. This may be due to lifestyle factors as recent years have seen an increase in unhealthy lifestyles with particular regard to dietary choices which are found to contribute to CRC [25].

Genetics: Others susceptible are those with a personal and family history of colonic polyps, a history of CRC or other cancers and digestive disorders such as inflammatory bowel disease (crohn's disease and ulcerative colitis) [26]. While genetic inheritance can influence the risk of CRC, research indicates that most risks of CRC are due to factors that are not inherited. Overall, genetic inheritance accounts for up to 20% of CRCs, which occur due to a gene mutation that increases ones susceptibility to developing CRC. Furthermore, most CRCs are sporadic; accounting for approximately 88% to 94% of incidences [12] caused by irreversible genetic damage due to certain lifestyle factors [27-29]. Additionally, majority of research indicates that 80% of CRC incidences have been consistently linked to lifestyle factors such as diet, exercise and weight [18,20,21]. Overall, age, diet and genetics emerged as the more prominent risk factors associated with CRC.

Modifiable risk factors associated with CRC risk

Diet: Of increasing interest is the importance of diet as it has long been suspected that to play a significant role in the aetiology of CRC [30]. Not only has diet been linked to physical diseases such as cancer, diabetes and cardiovascular disorders. Research exists stating that diet has also been linked to the incidence of psychiatric disorders [31]. Thus, reinforcing the hypothesis that diet plays a vital role in the reduction of CRC incidence. Substantial amounts of evidence have linked cancers such as breast, prostate and colon/rectum to diet. This bond is most predominant with CRC [6,20,32-34].

Westernisation of Diet: CRC is most common in the Western World due to diets which are characterised by excessive energy intake along with high intakes of dairy products, fat, protein, red meat, processed meat and refined carbohydrates [6]. Countries in Asia and Africa whereby CRC was previously relatively low are now seeing a dramatic increase in CRC incidence due to "Westernisation" of their diets. This is particularly evident amongst immigrants from Japan to USA and Europe where the incidence of CRC is has risen drastically in the past forty years, indicating that diet is an important factor [35,36].

Dietary Components Associated with CRC Risk

Fat

Traditionally, food from vegetable sources was the foundation of the human diet. Naturally, this was lower in dietary fat in comparison to current dietary trends whereby the evolution of diet has seen a significant increase in fat consumption [37]. The exposure of the bowel to high levels of saturated and animal fats is believed to increase the risk of cardiovascular disease, diabetes and cancers such as breast, colon and prostate. Evidence yielded for this hypothesis was markedly strong for CRC risk [38]. Lowest occurrences of CRC exist in developing countries within Asia and Africa whereby their diets are typically characterised as being low in fat but also high in fibre [6,39]. Furthermore, a recent randomised control trial suggested that consuming a very low fat vegan diet can reduce the risk of chronic disease such as cancer, thus supporting the hypothesis that a low fat diet may reduce CRC risk [40].

Red Meat

Results of a recent robust study carried out by cancer experts reported that the consumption of 50g red meat/day may increases ones risk of developing CRC by 20% [18]. While an apparent increased risk of CRC has been associated with red meat consumption, findings from another study reported that the incidence of CRC and red meat consumption varied amongst individuals [41].This may be due to aspects such as the carcinogenic effect from preparation of meat. Evidence has outlined that the consumption of 70g of well-done cooked red meat could account for up to 29% of CRC risk in comparison to a 10% increased risk with rare or medium cooked red meat [42]. Yet some individuals can have a genetic predisposition whereby they are more sensitive to carcinogens present in cooked meat. Consequently, their likelihood of developing CRC is raised in comparison to people without the gene [43]. Results of cohort studies suggested that meat is not a key risk factor in CRC because findings from the studies indicated that vegetarians in developed countries did not have lower mortality rates from CRC [44]. In addition to this, studies regarding beef consumption in Argentina, where diets of males are rich in beef consumption at approximately 300 grams per day [45] showed a comparable incidence of CRC with that of Canada. However, Argentina still has the highest incidence of CRC in Latin America [46]. However; this is not associated with total meat intake, suggesting that the relationship between red meat and CRC remains ambiguous. In spite of this, red meat is a good source of nutrients such as iron, b-vitamins and is also a quality source of protein [15]. Evidence to support the relationship between red meat in the increased risk of CRC is not yet conclusive; however there appears to be some relation between red eat and increased risk of CRC.

Processed meat

The correlation of CRC and red meat appears to be more so associated with the intake of processed red meat [45,47,48]. Ample evidence exists supporting the hypothesis that processed meat consumption is closely linked to increased CRC risk. An increase of just 25g of processed meat per day was associated to a 49% increased risk [49,50]. Processed meats are exposed to preservative known as nitrous oxide which has been closely linked to CRC incidence [51]. The suggestion that processed meat is a risk factor for CRC incidence is stronger than that of red meat.

Refined carbohydrates

An increased consumption of refined carbohydrates has been linked with the increased risk of an array chronic disease such as diabetes, cardiovascular disease, cancers of the stomach, breast, upper digestive tract, thyroid, and even the colon-rectum [52-55].The progression of diet has witnessed the influx in consumption of refined-carbohydrate food and a decreased consumption of unrefined carbohydrates such as whole grain food [53]. Due to processing, refined-carbohydrates vitamin, mineral and dietary fibre content is greatly reduced. Refined-carbohydrates are broken down very quickly as a result of a lower dietary fibre content. This in turn causes rapidly increasing blood glucose levels. Consequently, this causes a rapid increase in insulin. A high level of insulin triggers the production of a hormone known as the insulin growth factor-1 (IGF-1). As a result, IGF-1 leads to cell proliferation which in turn can promote the growth of cancerous cells in the colon and endometrium [56]. Examples of refined-carbohydrates include white bread, white rice and white pasta. As the progression of diet moves more towards an increased consumption of refined carbohydrates, we may lose the protection that many unrefined carbohydrates provide to us for against numerous chronic diseases including CRC [57].

Protective Dietary Components and CRC Risk

Dietary fibre

Fruits, vegetables, grains, pulses, roots, tubers, legumes, nuts are sources of dietary fibre. There are 2 types of dietary fibre: soluble and insoluble. Insoluble fibre is important in the prevention or treatment of constipation. Sources of insoluble fibre are grains, pulses, nuts and seeds. Soluble fibre is important in lowering blood cholesterol and stabilizing blood glucose. Sources of soluble fibre include fruits and vegetables. The role of dietary fibre in the colon is to increase faecal mass, increase the bacterial content of the stool, increase the water content of the stool, increase frequency of defecation, decrease intracolonic pressures and decrease colonic transit times [58]. There has been great interest in the prevention of CRC through diet and the hypothesis that dietary fibre can modify this risk is now well known [30]. The association of the relationship between high dietary fibre consumption and a lower incidence of CRC was first noted by Burkitt in 1971. Low incidences of CRC were observed in Africa as was a diet high in unrefined carbohydrates or dietary fibre [58]. Dietary fibre has been proposed as accounting for the different incidences of CRC between Africa and developing countries on the basis that an increased intake of fibre may increase faecal bulk dilute and bind potential carcinogens and reduce transit time [59]. According to Cotugna [60]. The biologic plausibility for this association therefore justifies this particular hypothesis. Conversely, modern day diets of Africans tend to be much lower in dietary fibre and the incidence of CRC has not risen dramatically, however, meat and animal fat consumption remained low [61-63]. Yet research indicates that diets low in dietary fibre is associated with increased CRC risk [64]. Dietary fibre intake amongst Irish people is lower than dietary recommendations [65]. It has been found that doubling of fibre intake from food in populations with low average intake of fibre could reduce risk of CRC by 40%, thus supporting the argument that dietary fibre is inversely related to the incidence of CRC [33]. Research has suggested that different types of dietary fibre are more protective against CRC, such as vegetable fibre rather than fruit or grain fibre [66].

Wholegrain/ Cereals

Whole grains are rich sources of dietary fibre. When consumed, dietary fibre present in whole grains is fermented in the colon by intestinal microflora into short-chain fatty acids and gases. Short-chain fatty acid production has been linked with a decreased risk of CRC [67]. Numerous studies support the hypothesis of dietary fibre consumption and the reduction in CRC. Intake of whole grain foods has been inversely related to the reduced risk of CRC [33].To further support this theory, a review of 58 epidemiological studies reported strong evidence to support that cereals provide a protective effect against CRC [68]. By contrast, a prospective study of almost 90,000 nurses in the USA over 16 years failed to show any protective benefit of fibre against CRC [69]. Likewise, a prospective cohort study in approximately 16,500 men conducted by Platz, Giovannucci and Rimm [70] failed to show any significant association between fibre and CRC. However, the USA nurses' study was based on a fibre consumption of 10-25g per day when the recommended daily intake is approximately 30-40g, and thereby limits the validity of the study [71]. However, a study carried out on Swedish women who are known for their high consumption of cereals and grains, and their low consumption of fruit and vegetables, identified that high intake of cereal did not lower the risk of CRC [72].

Fruit, vegetables and legumes

Abundant consumption of fruit and vegetables has been linked to a decreased incidence of several chronic diseases including cancer [73]. However, a low intake of fruit and vegetables was associated with an increased risk of CRC [72]. Additionally, a recent study carried out over 18 years highlighted that the consumption of four or more legumes per week in comparison to one serving per week or less resulted in a lower incidence of colorectal adenomas [74]. Another recent investigation carried out to determine the protective role of dietary fibre reported little evidence that dietary fibre intake lowers the risk of CRC [20]. However, it should be noted that the average dietary fibre intake of participants was 16.7g/day, well below the recommended intake levels of 30-40g/day and may account for the null findings. Also dietary habits may have changed over the 8-year period, some participants may also not have been honest and so the food frequency questionnaire may not accurately reflect fibre intake and therefore limit this study [71]. Mai et al. [20] suggest that limitations as a result of dietary measurement errors and trials with short follow up suggest that the issue is not yet resolved. Dietary fibre may be protective but poor assessment tools and lack of repeat measures in most studies may bias the estimates towards the null [75]. Combined results of a current review of five quasi-randomised and randomised controlled trials demonstrated no evidence that dietary fibre reduces the incidence of CRC within a two to four year period [76]. However,

this study was completed over a short period of time. Therefore, possible recommendations include the use of longer-term trials and higher levels of dietary fibre in future trials. Lawlor and Ness [75] suggest that trials of longer duration are required for a protective effect to be detected. A high intake of dietary fibre is recommended from childhood to have any beneficial or protective effects against CRC. Research has indicated that it may take at least 5-19 years of dietary intervention to have any protective effect against CRC. Diet alone is not enough to reduce the incidence of CRC. An individual's lifestyle is just as important as a healthy diet for the prevention of CRC [77]. The role of fibre in preventing CRC is however controversial. Variations in studies relate to the complex interactions of fibre and other components of the diet [78].Evidence reporting that higher intake of fibre will reduce risk of CRC has weakened greatly (Dove-Edwin and Thomas 2001). However, this recommendation may be justified by the strong and consistent inverse relationships between fibre consumption and risk of coronary heart disease and diabetes [20].

Folate and carotenoids

Many nutrients within vegetables such as folate and carotenoids have been associated with a reduced risk of CRC [34]. Green leafy vegetables are a source of dietary folate. Studies have found that long term supplementation (approxiamately10-15 years) of folate in the form of folic acid has been associated with a reduced risk of CRC [79,80].

Lycopene

Evidence suggested that tomatoes were found to protect against CRC. Tomatoes contain a powerful carotenoid antioxidant known as lycopene and this has been associated with reduced risk in a number of cancers including colorectal and prostate. Heat enhances the bioavailability of lycopene. Therefore, when tomatoes are cooked, then lycopene levels are higher [80,81]. Lycopene was found to reduce the chance of cancerous cells developing in the colon and assisted with cell death or apoptosis within the colon [82]. However, a recent study found that lycopene only has a minor impact on reducing CRC risk. This study was completed over 2 weeks, which suggests that perhaps the study was carried out over too short a period to show any significant results [83]. Future studies could possibly include a longer period for more consistent results. Conversely, a recent pooled analysis of 11 cohort studies also suggested that lycopene does not play an important role in the prevention of CRC [84,85].

Body fatness

Strong associations with CRC risk are linked with obesity and lack of exercise [11].To counteract this risk, encouragement of regular exercise can be promoted as a preventative measure against CRC risk [86].

Additional Preventive Measures

Various studies have outlined that aspirin and non-steroidal anti-inflammatory (NSAID) medications may play a role in the risk and development of CRC [87]. Hormone replacement therapy HRT may play a role in the development of CRC too but it also may increase the chances of developing other cancers, such as breast and ovarian [88]. It is recommended to choose diet and lifestyle changes along with dietary supplements to protect against the risk factors associated with CRC. While there is a general consensus that lifestyle and diet are factors that influence the incidence of CRC, although it is difficult to ascertain if any one component plays a dominant role. Diet alone is not enough to reduce the incidence of CRC. An individual's lifestyle is just as important as a healthy diet for the prevention of CRC [77]. In the interim it is essential for nurses to provide accurate and timely information on lifestyle, diet and cancer risk reduction to their patients and the public and to encourage compliance with current dietary recommendations.

Primary care and prevention

Primary care is the initial point of contact which the public have with health and personal social services. Primary care teams are mainly comprised of GPs, nurses/ midwives, health care assistants, home helps, physiotherapists, occupational therapists, social workers and administrative personnel. Key aims of primary care include utilizing services and resources to help prevent conditions or diseases which may later require hospitalization. One of the core goals of a recent health strategy was to make primary care the central focus for the delivery of health care around Ireland [89]. One of the key aims of primary care is known as primary prevention and this can be defined as an action taken to prevent the likelihood of a disease occurring in a susceptible population. Therefore, primary prevention has the potential to greatly reduce incidence of CRC. Information presented in this review has highlighted diverse risk factors and dietary components which may contribute to a higher risk of CRC. Once genetic or environmental risk factors are identified, the focus on primary prevention should commence with regard to adjustments in lifestyle and dietary factors. Nurses can play a definitive role in primary prevention *via* various methods of health promotion and education [15].

Role of the practice nurse

Practice nurses (PN) are registered general nurses who are privately employed by general practitioners (GP) and are based in GP practices around Ireland. They are concerned with the various health concerns of the public. The role of the PN involves working with various populations of all age groups to provide a continuum of primary, secondary and tertiary care over the human life span. However, post-registration courses will enhance the role of the PN, thus increasing their range of duties as a nurse. Many PN's have already undertaken relevant diploma, degree or masters courses and are recognized as clinical nurse specialists within GP's.PN's also play a vital role in Health Promotion and Screening. Furthermore, many nurse-led clinics for the nursing management of chronic diseases, such as Asthma, Diabetes, etc. have been set up. Consequently, they play a vital role in primary care. Already, it has been recognized that there is a great need for preventative measures regarding CRC. Therefore, PN's are central for planning, organizing, implementation and evaluation of a primary/ secondary prevention programme for CRC within primary care [90].

Health promotion

Health Promotion can be defined as a process which incorporates aspects such as disease prevention, reducing the likelihood of premature death or illness, disease management, empowering the public to take responsibility for their own health and devising legislation to improve public health. The aim of health promotion is to enable the individual to obtain or maintain an overall functional level of health [91]. Models of health promotion such as empowerment aid the PN in delivering effective health promotion. The empowerment

model can be defined as where the individual is given knowledge and skills to enable them to develop a sense of control or power over their lives. As a PN, one can empower the individual by informing them about CRC, signs and symptoms of it, what to do if there are any symptoms, encourage the uptake of screening and increase awareness of primary prevention [92].

Health promotion and CRC

Currently in Ireland there exists health promotion programmes such as smoking cessation programmes, cardiovascular health programmes and diabetes health programmes which all incorporate healthy lifestyle changes as part of their programmes. With regard to cancer, it has been reported that primary care in prevention and health promotion is currently under availed of [89]. It is possible that the primary prevention of CRC is currently not being fulfilled. However, research regarding the primary prevention of CRC in Ireland is scant. Yet evidence exists reporting that up to a third of cancer could be prevented by public health action and the promotion of a healthy lifestyle Furthermore, evidence exists that majority of Irish people seek help at advanced stage of disease. Very little research exits on Irish people's health knowledge, health seeking behaviour and their access to health care facilities and how this influences Ireland's high CRC incidence and mortality rate However, men appear to be less convinced of the value of preventative behaviours and tend to report lower rates of many heath protective behaviours [93]. Other researchers concur with this view that women are more responsive than men to public health recommendations regarding changes in dietary habits [94]. Men visit the doctor less often particularly for preventative rather than curative care Research addressing why this is the case is however scant. The lower level of awareness of male-only cancers may reflect the lower levels of publicity about men's cancer. Media coverage of prostate cancer and CRC is one-third of that devoted to breast cancer [95]. One might deduce that male health concerns have a lower profile across society as a whole. Therefore, future health promotion initiatives may incorporate strategies which could focus on increasing men's' awareness regarding the primary prevention of CRC.

CRC Screening in Ireland

CRC screening is the only form of cancer screening available to men and women and is being widely promoted by professional bodies A recent study carried out in 2006 by the Irish College of General Practitioners funded by the Irish Cancer Society found that there was an urgent need for the public to become more aware of cancer symptoms, improved access or centralization of cancer services [96]. Therefore, PNs can play a crucial role in influencing the awareness of CRC, the signs and symptoms of it, other preventative lifestyle factors such as diet and the uptake of screening. It has been suggested the advent of screening and well-targeted public health promotion programmes may lead to reductions in CRC [94]. Also a recent pilot study reported that mortality is greatly reduced with the implementation of a CRC screening programme [97]. Yet studies have confirmed that uptake of CRC screening is suboptimal [98]. Currently, Ireland has no colorectal screening programme. Yet twenty-one countries within Europe have already implemented a CRC screening programme. One of the key messages of a recent Irish strategy, "A Strategy for Cancer Control" recommended that a colorectal screening programme to be implemented. The public's awareness needs to be raised regarding colorectal cancer and the importance of early detection [89]. Subsequently, the Minister for Health and Children established the National Screening Service. At present, there is a colorectal cancer screening programme being explored by an expert group for the National Screening Service. From this, evidence-based recommendations on the future development of a colorectal screening programme in Ireland will be reported. While this is positive advancement, it could be many years before this reduction in the number of CRC cases is reflected by implementing primary preventative measures.

Barriers to health promotion in ireland

Overall, diet and body fatness were the most predominant risk factor for CRC. As they are both modifiable risk factors, there is a plenty that nurses can do in the promotion of primary preventive measures and also encouraging positive yet active lifestyle behaviours. People's lifestyles must be addressed and certain areas such as diet need to be targeted. Also, certain risk groups for CRC such as people who are overweight, people over 50 years old, people with a genetic predisposition or any current bowel conditions (inflammatory bowel disease, crohn's disease, ulcerative colitis) need to be targeted. However, before nurses may impart any knowledge through any health promotion activities, they have to possess the knowledge themselves. While health promotion is a core component in practice nursing, there seems to be a lack of understanding amongst Irish nurses. Yet to implement health promotion, one is required to possess knowledge of health promotion and to recognise that it is a broad concept. Barriers to employing health promotion practices were mainly directed towards lack of comprehension and lack of education [99]. Therefore, this may be indicative of the necessity for an educational programme on health promotion and preventative factors on CRC for PN's. PN's need to be empowered themselves before they can empower others [100]. Retraining and educational programmes may contribute in addressing any barriers to implementing health promotion. Research regarding PN's knowledge on primary preventative factors of colorectal cancer is scant thus suggesting the necessity for further research within this area.

This literature review set out to review the current body of literature in relation to lifestyle factors and CRC and the role of the nurse in the primary prevention of CRC. Evidently, it has been demonstrated that lifestyle factors, in particular diet and weight, have a definite impact on the incidence of CRC. Yet, there is a lack of public awareness of this. Nurses were identified to play a vital role in health promotion and the primary prevention of CRC; very little studies in Ireland exist on this topic, even though this has been identified as a major public health concern. It is apparent that there is a clear void in the current body of literature on the nurses' knowledge of the primary prevention of CRC and whether primary preventative measures are being publicised effectively to the public or at all. All of these factors could have a huge impact on the incidence/mortality of CRC and so this area needs to be promptly addressed. Deriving from this gap in the literature the author proposes a study to explore nurses' knowledge on the primary prevention of CRC.

An exploration into Irish practice nurses' knowledge of the primary prevention of colorectal cancer.

CRC can be detrimental if not detected early enough, yet it is a highly curable disease through lifestyle and environmental factors [11]. Within the Irish context, approximately half of all CRC incidences result in death [2]. Evidently, CRC is a major public health concern in Ireland with the national cancer reporting a 3% annual rise in the incidence. Majority of CRC is diagnosed at later stages whereby prognosis is generally grim [11]. Aspects contributing to this are a lack

of public awareness of common signs and symptoms and a reluctance to partake in CRC screening. Currently there is no CRC screening programme in Ireland, even though Ireland has the highest level of mortality from CRC amongst neighbouring countries in Northern and Western Europe [35]. From the literature review, the reader may have developed an appreciation for why preventative strategies are so important in reducing and preventing the incidence of CRC. Additionally, the correlation between lifestyle factors such as body weight, exercise, diet have been long debated and supported by a fine body of evidence. Extensive research carried out by the World Cancer Research Fund reinforced this concept with particular emphasis on diet and body fatness [18]. As evident in the literature review, the role of the practice nurse is of utmost importance as he/she can increase public awareness through various means of health promotion by encouraging the uptake of CRC screening and educating the public on environmental factors influencing CRC. Yet very little evidence exists to indicate whether or not this is being fulfilled. Effective health promotion activities in regards to primary prevention of CRC could dramatically reduce the incidence of CRC; therefore, it is vital to assess whether or not practice nurses are implementing necessary health promotion strategies or whether they even possess sufficient knowledge. Research suggests that the necessary health promotion is not being publicised due to specific barriers. Barriers to implementing health promotion such as lack of education on the topic were identified in the literature review and this may be indicative as to why there is a lack of public awareness of primary prevention of CRC is lacking. It is only through regular educational sessions and study days that the correct information can be widely dispersed, to yield increased knowledge and awareness of the primary and secondary prevention of CRC [99]. Currently in Ireland, no study exists indicating the practice nurses knowledge on the primary prevention of CRC, thus suggesting that the health promotion of primary prevention of CRC is not being acknowledged or that little is known about it. Are Irish practice nurses aware of primary preventative measures of CRC and if so, are they increasing public awareness via methods of health promotion? The aim of my study is to outline a quantitative methodological study to investigate the current knowledge of practice nurses on the primary prevention of CRC. The researcher proposes to send out a questionnaire to explore and determine the aim of the proposed study. There is justification for undertaking this research as no studies have been conducted on this topic in Ireland to date.

Research Objectives

To determine the practice nurses current knowledge on the primary prevention of CRC. To establish whether practice nurses are implementing any health promotion activities to increase public awareness of the primary prevention of CRC.

Design and Methodology

The approach adopted will depend on various factors such as the nature of the phenomena to be investigated, the aim of the research and the states of the existing knowledge. Qualitative and quantitative are two opposing approaches used to facilitate research. Quantitative research aims to measure the reality of facts about a situation and seeks to define it by careful measurement usually in the form of numerical data which is then subjected to statistical analysis. The aim of a quantitative study is to eradicate extraneous variables and assess findings using standardized testing systems [101]. Common in clinical and medical research, quantitative research is an essential part of health services research to assist in generating new knowledge about concepts whereby research is limited or has not yet been conducted. In contrast, qualitative research adopts an exploratory approach aiming to describe, explain and gain an understanding of experiences people may have. This concept can be related to gaining an understanding of a social phenomenon rather than an experimental/scientific setting with emphasis on the meanings, experiences, attitudes and views of the participants [101]. Data obtained from qualitative research tends to be represented in the form of words rather than numbers. These words are based either upon observation, interviews or documents and can be categorized into themes. Qualitative research is more appropriate for gaining an insight into the lived experience whereas quantitative is more appropriate for gaining scientific data. For the purpose of this study, a quantitative approach will be employed.

Sampling

Sampling is whereby a proportion of participants are selected to take part in a study. If the sample is carefully selected then it can present a concise representation from the population from which it was drawn [101]. Selection of participants will be made on the basis of their ability to provide relevant information to the area under investigation a method known as "purposive sampling". The researchers' choice of subjects must be based on deliberate selection according to their suitability.

Sample selection

Purposive sampling is an increasingly common strategy in which the researcher's knowledge of the population and its elements is used to pick the cases to be included in the sample [101]. Participants are deliberately chosen by the researcher on the basis that these are the best available people to provide data on the issues being researched. Therefore, the sample will be drawn from the Irish Practice Nurses Association. Sample sizes for quantitative research are required to be larger than qualitative in order to bear any statistical significance. A sample of approximately 450 practice nurses will be used for the purpose of this study so to bear statistical credibility.

Inclusion criteria

- All registered general practice nurses with a qualification in practice nursing.
- Practice nurses registered with the Irish Practice Nurses Association (IPNA) because this national body is representative of practice nurses throughout Ireland.

Exclusion criteria

- Practice nurses who do not possess a post registration qualification in practice nursing.
- Practice nurses who are currently not practicing.

Permission will be sought from the Local Research ethics Committee and the University Research Ethics Council in Dublin City University (See appendix 1). A letter will be written to the Irish Practice Nurses Association which will inform them of the details of the proposed research and gain their co-operation (see appendix 2). After the identification of potential and suitable participants from the IPNA, initial contact will be made by the associations' secretary. The secretary will then contact each of the suitable participants and explain to them the purpose of the study. Their permission will then be sought

as to whether or not they wish to be included into the study. If he/she agrees to participate then a letter further explaining the rationale for the study and reassuring the participant that all information is confidential, along with a questionnaire and a return stamped addressed envelope will be posted out to all agreeing participants. Informed consent is not necessary as the study will be anonymous and it is a questionnaire; therefore, there is no likelihood of harm to participants. Participants agreeing to partake in the questionnaire will suffice as consent.

Pilot study

Pilot studies are common in quantitative research as they give the inexperienced researcher the opportunity to review their chosen method of data collection and also indicate the need for any alterations so that the true study can be improved. A study's credibility can be improved by piloting the instrument, in this case, a questionnaire. The pilot study will be a smaller version of the proposed study; it will provide the researcher with a trial run before commencing the main study. Thus, allowing the opportunity to alter the study so that the finest results can be obtained via the most appropriate research method. An informal type of pilot study will be conducted by doing a trial-run of the questionnaire with 50 practice nurses and subsequently consulting with the research supervisor to analyse the validity of the questions utilized.

Data collection

There are various research tools which can be used to collect data. Both interviews and questionnaires are strong means of obtaining information as they approach the topic directly [101]. Questionnaires are instruments designed to obtain information from people about knowledge, attitudes, beliefs and feelings [101]. For the proposed study, a questionnaire will be issued to all agreeing participants. Questionnaires are the most common method of data collection in social and health research. Advantages of questionnaires include that they are less expensive, less time consuming and easier to analyse that phone calls or interviews, especially when looking at large numbers. Also, with no interviewer present, there is an increased assurance that the likelihood of interview bias will not occur, therefore, the questionnaire is more likely to yield honest answers The aim of the proposed questionnaire is to measure their current knowledge and beliefs as well as factual information. Simultaneous triangulation will be used for the data collection. Both open and closed-ended questions will be used in the questionnaire. While the quantitative approach is the basis for the proposed study, qualitative methods such as open-ended questions can provide the researcher with complementary information. All data obtained will be stored on a computer which will be secured by with a password and only accessible by the researcher. Two key factors concerned with questionnaires include reliability and validity. Reliability related to the accuracy or consistency with which the questionnaire can reproduce data. Validity relates to the confidence in the accuracy of the results yielded and the relevance it has to what it is supposed to be measuring. Instruments used for research must be tested for reliability and validity. Reliability can be examined by carrying out a test re-test procedure. This will confirm the questionnaires accuracy and consistency.

Data analysis

Data analysis takes place when all data has been collected. For readers to appreciate the value of research and understand how it may bear any relevance to their practice, it must be analysed. Statistical procedures will enable the researcher to reduce, summarise, organise, evaluate, interpret and communicate numeric information regarding the findings of the proposed stud [102]. All data obtained from closed-ended questions on the questionnaire will be categorized by assigning numbers according to the order in which they were answered. Thus meaning "agree" would correspond with a marked answer of "5", "somewhat agree" with a marked answer of "4", "don't know" with a marked answer of "3", "disagree" with a marked answer of "2" and "strongly disagree" with a marked answer of "1". Analysis of open-ended questions tends to be more time consuming and more difficult as responses can vary greatly unlike close-ended questions. To analyse data from open-ended questions, the researcher will identify specific words and phrases which frequent the data in order to interpret, evaluate and organise the data [103-105].

Statement of Resources

Funding for the proposed study will be sought from the Health Service Executive, the Health Research Board, the Department of Health and Children and the Irish Practice Nurses Association. It is likely that these organizations will recognise the value of the study and the potential benefits may have for the prevention of CRC. They may therefore provide funding for the proposed study. The expenses specified below are likely to be encountered by the researcher, a part-time Masters student, while conducting the research study. The total cost of the study over the eighteen months period is predicted to be €31,465. This will cover the cost of the salary of the researcher who will engage in data transcription, analysis and contacting the practice nurses. Computer hardware such as a laptop and printer will be purchased for the transcription and storage of data, analysis of information using a computer software package and to print the questionnaires and letters to send to the relevant bodies. Stationery includes the estimated cost for extra stamped addressed envelopes and reminder letters which will be posted out to the relevant practice nurses. The estimated travel expenses will cover the cost of travelling. Finally, the total cost of telephoning relevant bodies to clarify issues and the use of the internet will be accounted for. The following are estimated costs that may be incurred by the researcher [106].

Limitations

Despite the best efforts of the researcher, there may be potential limitations in the methodology of the study. One of the limitations of this study could be a poor response rate to the questionnaire which, which may result in data not being statistically relevant. There is a risk that the questionnaire may not be answered by the practice nurse but by someone else in their family/household as this can be the case with mailed questionnaires. Additionally, there is no opportunity for the participant to ask for clarification on specific questions. The lack of experience of the researcher may also be considered a limitation of this study. Also, the questionnaire is only being used for the first time in this study. However, these limitations may be reduced through the use of the pilot stud [101]. To further reduce likelihood of limitations, the researcher will actively engage with the supervisor for advice or clarification of issues as they arise throughout the duration of the study.

Ethical Considerations

Ethical issues are common to all research, yet each study has its own individual ethical implications [101]. Researchers strive to maintain the principal aim of ethics which is, to do well and minimize harm towards participants of the study. However, achieving a balance can prove challenging, particularly when researchers are keen to gain meaningful insights into the participants lives As this proposed study is focused on practice nurses' current knowledge, the risk of harm and compromise of any of the ethical principles is minimal. For the proposed study, all participants will be asked to give their informed consent (see appendix 4) prior to commencing the study. Informed consent is whereby the researcher informs the participants about the study, any potential risks or benefits involved in partaking in the study so to assist the participant to make an autonomous decision whether to participate in the study or not [101,107]. Confidentiality of each participant will be maintained as the questionnaire will not require participants to state their name or any personal details which may compromise their anonymity. As previously mentioned, all data obtained will only be accessible by the researcher as it will be stored on a computer and secured with a password only known by the researcher. A formal letter will be submitted to the research ethics committee, the Irish Practice Nurses Association to seek approval in conducting this study. This letter would include the nature and purpose of the study.

Dissemination of Knowledge

The dissemination of the findings of the proposed study should help to highlight any areas whereby practice nurses are lacking in knowledge of the primary prevention of CRC. As practice nurses are vital in health promotion, the findings should also help to emphasise the importance of public health awareness of the primary prevention of CRC. Dissemination of knowledge is an essential part of research within nursing [101]. If results of a study are not communicated then they are of little use, and thus the study will not have any impact on the topic of research. Dissemination of the knowledge sought is the final step of the research process. The findings of the study will be disseminated through presentations given at journal clubs, in-service days or conferences within surrounding hospitals or organizations. Copies of the research findings will be circulated to the director of services in Health Service Executive regional area, the Health Research Board, to the Irish Practice Nurses Association and to the relevant G.P.s where the practice nurses partook in the study. A copy will also be forwarded to nursing and clinical journals in the hope of publication. These approaches were chosen with a view to maximizing the dissemination of the findings of the study thus potentially influencing current nursing practice.

Discussion and Conclusion

CRC is the third leading cause of cancer death in Ireland and it is one of the only cancers which can be prevented, yet little is known about Ireland's primary preventative measures *via* practice nurses. This proposed study will explore practice nurses knowledge on the primary prevention of CRC. It is anticipated that the research will outline that there is a lack of knowledge on the primary prevention of CRC and a necessity to re-educate practice nurses on this topic. A quantitative approach will be used to assist in undertaking the study. The research tool that will be used is a questionnaire with both closed and open-ended questions. It is expected that approximately three hundred practice nurses will participate in the study. A pilot study will also be outlined. The method of data analysis will also be described [108]. The resources required for the study are reasonable and the research topic should not cause any major ethical or access difficulties. As nurses knowledge is being explored; nurse education will be influenced by the proposed study. The findings of the study could be incorporated into the education and training of nurses and possibly into some health promotion modules for under-graduate nursing students. It would be expected that the proposed study will highlight areas which need to be addressed and inspire further research to be conducted on the subject thus enhancing the findings of this study. The overall benefit of the study will be to the public as the findings of the study will outline the necessity for an increased level of knowledge and re-education on the primary prevention of CRC amongst practice nurses [109]. By doing so, practice nurses could play an imperative role in the prevention/incidence of CRC in Ireland.

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