

Bowel cancer knowledge gaps evident among Irish residents: Results of a national questionnaire survey

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Abstract

Background

The extent of knowledge of bowel cancer, its symptoms and risk factors are unknown in Irish residents. An understanding of bowel cancer awareness may be useful in aiding healthcare professionals and policy makers develop improved bowel cancer awareness programmes and public health initiatives in Ireland.

Aims and Methods

A 22-question online questionnaire survey was designed to gather data to assess residents' awareness of bowel cancer, its symptoms and risk factors and to determine reasons for not participating in BowelScreen Ireland.

Results

There were 449 participants (329 women, 119 men and 1 'prefer not to say'). The majority of participants were aged 35-49 years (42.8%) and 82.6% had completed a third level qualification.

Irish residents (non-healthcare professionals/scientists (NHCP/S)) recalled on average less than three warning signs/symptoms.

Among NHCP/S the most well recalled protective diet and lifestyle choices were active lifestyle/exercise (62.1%), a fibre rich diet (45.4%) and no/low alcohol consumption (32.1%). Many were unable to recall red and processed meat as risk factors with only 10.7% and 4.9%, respectively, citing these foods. However, prompted awareness was superior with 71.1% agreeing or strongly agreeing that consumption of red and processed meat is a risk factor.

43.4% said they would be 'fairly confident' in recognising a sign/symptom but more than a third (38.7%) reported they were 'not very confident'.

Conclusion

This survey emphasises the need to improve the awareness of bowel cancer as gaps in this specific cancer knowledge were evident among Irish residents.

Key words: Colorectal cancer, awareness, prevention, help-seeking

1.0 Introduction

In Ireland, colorectal cancer (CRC), more commonly known as bowel cancer, is the second most common incident cancer in men and the third in women [1]. There are approximately 3,000 cases diagnosed each year [1]. The majority (57%) of bowel cancer cases are diagnosed in the late stages (III/IV) [1]. Colorectal cancer is responsible for 12% and 10% of cancer deaths in males and females, respectively [1]. Additionally, screening rates are low, with only 41.2% of eligible adults participating [1-2]. Furthermore, the incidence of this cancer is rising in younger adults in Ireland [3].

Despite these alarming statistics, little is known about the knowledge level of Irish residents regarding bowel cancer. Knowledge is an important prerequisite for instigating behaviour change as cancer awareness will often be an essential first step towards healthcare seeking and screening attendance [4-6]. Studies in Irish patients have found a lack of awareness of bowel cancer, its symptoms and risk factors, but this has yet to be studied in Irish residents [7-9].

The main non-modifiable risk factor for bowel cancer appears to be age. More than 90% of bowel cancer cases occur in people aged 40 years and older [10]. However, the incidence of bowel cancer among younger individuals is rising [3], highlighting the need to establish not only the root causes of the rise in incidence but also the knowledge in this group. Approximately 5-10% of bowel cancer cases are associated with recognised hereditary conditions [11]. Most bowel cancer cases occur in individuals without a family history of the malignancy; however, it appears to be a significant risk factor [11-13]. Additionally, a personal history of adenomatous polyps, irritable bowel disease and/or other medical conditions are also non-modifiable risk factors [14].

Studies have consistently reported a higher risk of developing bowel cancer among individuals with moderate to heavy alcohol consumption [15]. A meta-analysis of 27 cohort and 34 case control studies concluded that, compared with never drinkers, moderate alcohol drinkers (2-3 drinks per day, RR 1.21, 95% CI 1.13-1.28) have a 21% increased risk of bowel cancer, while heavy drinkers (4+ drinks per day, RR 1.2, 95% CI 1.27-1.81) have a 52% increased bowel cancer risk [16]. According to the World Cancer Research Fund (WCRF), collating the evidence, there is strong convincing evidence that consuming two or more alcoholic drinks per day increases the risk of bowel cancer [17].

Tobacco smoking has also been shown to increase the risk of developing bowel cancer. The WCRF report smoking 40 cigarettes a day increases risk of this cancer by 40% [17].

Although the data is not entirely consistent, consumption of red meat and processed meat appears to be associated with an increased risk of CRC and the WCRF concluded evidence was convincing for processed meat, while evidence for red meat was probable [17]. The WCRF therefore recommend limiting consumption of red and processed meat.

The WCRF also reports overweight, and obesity, particularly central obesity, increases the risk of developing bowel cancer [17]. An umbrella review of systematic reviews and meta-analyses concluded bowel cancer risk is 30% higher in men and 12% higher in women per 5-unit Body Mass Index (BMI) increase [18]. This association in men was supported by strong evidence, however for women, evidence was noted as 'suggestive' due to substantial heterogeneity, small study effects and excess significance bias.

A study comparing rates of CRCs across Europe found that 53% of bowel cancers are potentially avoidable through lifestyle modification [19]. Substantial observational data and several systematic reviews have reported that regular physical activity is associated with protection from CRC [20-24].

The role of fibre in reducing bowel cancer risk has long been established. There is strong probable evidence that wholegrains and foods containing dietary fibre reduce the risk of bowel cancer, while noting the substantial heterogeneity between studies and no significant association in the dose-response meta-analysis of 21 prospective studies [17].

The WCRF found strong probable evidence that consuming dairy products and taking calcium supplements decreases bowel cancer risk [17].

Cancer organisations agree the signs and symptoms of bowel cancer can include bleeding from the back passage; blood in the stool; a change in bowel habit; pain in the back passage; pain in the abdomen; a lump in the abdomen; a feeling the bowel does not completely empty after a bowel movement; tiredness/anaemia; and unexplained weight loss [25-26]

There appears to be a reluctance to discuss bowel health. This is reflected in the media as bowel cancer is generally underrepresented relative to its population burden [27-29]. A study assessing public awareness of bowel cancer in Europe found 84% of people from the UK reported a feeling of embarrassment regarding bowel related symptom discussion, leading to a delay in seeking help [30]. Delayed presentation to a healthcare

professional regarding possible bowel cancer symptoms is well documented in the literature [31-32]. Delayed help-seeking has also been reported amongst Irish patients, who allowed symptoms of bowel cancer to persist beyond one year before attending for investigation [8], however attitudes of the Irish public have not been previously researched.

Furthermore, the reasons for poor participation in those eligible for BowelScreen Ireland are unclear. Many barriers to screening participation have been identified across a range of studies: concerns regarding the hygiene and storage of the test, gender, and perceived low risk of bowel cancer [33-40]. However, most of this research was based on screening techniques which did not involve the faecal immunochemical test (FIT), the test kit Ireland's national screening programme employs. Qualitative Irish research has described themes of fear, fatalistic beliefs, less knowledge, negative attitudes, emotions, and beliefs towards screening [41]. Both the low uptake percentage and limited investigation of reasons for disengagement with BowelScreen identifies a gap to establish reasons for not participating in screening in Irish residents.

The aim of this study is to ascertain the knowledge of bowel cancer; its symptoms and risk factors and determine reasons for not participating in screening in eligible Irish residents.

1.0 Methods

2.1 Study design, setting, sampling and participants.

Participants were recruited by means of social networking sites affiliated with the Health Service Executive (HSE), Breakthrough Cancer Research, Marie Keating Foundation, Men's Health Ireland, Senior Care, and by popular Irish online discussion forums.

Our target population included Irish residents that were 19 years and over. Individuals who did not reside in Ireland and were 18 years or less were excluded from the study.

The study protocol was approved by the University of Chester Faculty of Medicine and Life Sciences Research Ethics Committee (frec@chester.ac.uk). Participants were asked to indicate their consent to participate, following reading a participant information sheet (PIS), before taking part in the study.

2.2 Measurement procedures

2.1.1 Survey instrument

A survey of 22 questions was constructed. Most questions were determined using the relevant modules from Cancer Awareness Measurement, UK (CAM). "This survey instrument (Bowel CAM) was developed by University College London and Cancer Research UK. It is based on a generic CAM developed by Cancer Research UK, University College London, and Oxford University in 2007-2008 (Cancer Research UK, 2014)" [42]. Additional questions were based on a thorough literature review on this topic, the findings of the WCRF bowel cancer report 2018 and National Cancer Registry Ireland (NCRI) findings 2017-2019.

The survey was split into sections; 1. Demographics (8 items), 2. Risk factors focused on diet and lifestyle (15 items, 1 unprompted and 14 prompted), 3. Bowel cancer statistics (3 items), warning signs/symptoms (10 items, 1 unprompted and 9 prompted), delay in seeking medical help (1 item) and confidence in detecting a bowel symptom (1 item) and finally, 4. Screening (3 items). Awareness of risk factors and warning signs/symptoms were assessed using unprompted and prompted items. The first item was unprompted and asked respondents to generate responses from memory. The second was prompted, displaying a list of warning signs/ symptoms or risk factors, and asked respondents to indicate whether they could be signs/symptoms of CRC with response options 'yes'/'no'/'don't know' for warning signs/symptoms and a 5-point Likert scale for risk factors ('strongly agree' - 'strongly disagree').

The survey was uploaded to JISC online surveys (<https://www.onlinesurveys.ac.uk/>) and was live for 8 weeks, from 01/04/2021 to 27/05/2021. Most questions were set up in a way in which a response was compulsory.

2.2.2 Item scoring

For the prompted warning signs/symptoms items, 'No' and 'Don't know' responses were combined and scored '0' and 'Yes' responses scored '1'. For the prompted risk factor items 'Strongly agree' and 'Agree' responses scored '1' and 'Not sure', 'Disagree' and 'Strongly disagree' responses scored '0', except for one item 'not taking a multivitamin' where 'Disagree' and 'Strongly disagree' were scored '1' and 'Not sure', 'Agree' and 'Strongly agree' scored '0'. Total scores for prompted awareness of warning signs/symptoms (maximum score of 9) and risk factors (maximum scores of 13) were calculated by adding the recorded responses together. For the 'age at risk' item 'a 60-year-old' response scored '1' and all other responses given a score of '0'. The two items on how common bowel cancer in men and women is in Ireland, '2nd most common' and '3rd most common' scored '1', respectively, and all other responses scored '0'.

A cumulative knowledge score for the warning signs/symptoms (range 0-9) was obtained by summing up the correct answers to the 9-item question. A cumulative score of 7 or above indicated awareness of CRC warning signs/symptoms, whereas any score lower than 7 implied insufficient awareness. This grading was done according to the Heath Belief Model and the guideline set by CAM.

A 'total knowledge score' for NHCP/S participants was calculated by adding the total score for prompted warning signs/symptoms and risk factors to scores for items: age at risk of CRC and how common is bowel cancer in men and women. The possible range of scores for knowledge was between 0 and 25. Scores were converted into percentages, and the obtained percentage scores were reported in terms of two categories: a high level of knowledge (≥ 16 ; a cut-off value of $>65.1\%$ correct responses) and a low level of knowledge (< 16 ; a cut-off value of $<34.9\%$ correct responses). The chosen cut-off value was based on the mean and median value of approximately 16 (Mean 15.4, SD 3.6; Median 16) for the knowledge score among this group of Irish residents. Other items of the questionnaire were excluded from the total knowledge score based on the nature of those questions.

2.3 Statistical analysis

After the survey closed, the data was cleaned and coded and transferred to SPSS version 26.0 (IBM Corp., Armonk, NY, <https://www.ibm.com/analytics/spss-statistics-software>) for analysis.

Descriptive analysis was conducted to provide a summary of the characteristics of our study sample and response data on CRC awareness presented numerically in terms of frequencies and percentages.

The data from NHCP/S is presented first with data from HCPs/scientists (HCP/S) reported thereafter.

3.0 Results

3.1 Demographics: There were 449 participants (330 women, 119 men and 1 ‘prefer not to say’) surveyed between the months of April and May 2021. The demographic distribution of participants is shown in **Table 1**. Most of the sample was 35-49 years (42.8%). The participants were educated, with 371 (82.6%) having completed a 3rd level qualification. Furthermore, 103 (22.9%) were healthcare professionals (HCPs)/scientists.

Table 1: Demographics of study participants

Characteristic	No.	%
Age group		
19-34	134	29.8
35-49	192	42.8
50-65	99	22
65+	24	5.3
Gender		
Male	119	26.5
Female	329	73.3
Prefer not to say	1	0.2
Education level		
No formal education or training	1	0.2
Finished primary school	3	0.7
Finished secondary school	58	12.9
Skilled trade	16	3.6
3 rd level qualification	371	82.6
HCP/scientist		
Yes	103	22.9
No	346	77.1
Knowing someone who has/had bowel cancer		
Yes	221	49.2
No	228	50.8

3.2 Diet and lifestyle risk factors:

Awareness of diet and lifestyle protectors and risk factors were assessed using an unprompted and prompted question. Among participants who were NHCP/S, unprompted awareness of protective diet and lifestyle choices was variable. The most well recalled choice was an active lifestyle/exercise, mentioned by 62.1%. A healthy/balanced/varied diet and the inclusion of fruits and vegetables in the diet were recalled by 32.1% and 31.2%, respectively. However, recall of more specific dietary factors identified knowledge gaps: 45.4% stated a diet rich in fibre to be important, but only 10.7% and 4.9%, respectively, believed no/low red meat and no/low processed meat consumption to be protective. Among participants, 32.1% mentioned abstaining from alcohol or drinking alcohol within current national recommendations would be protective and a further 22.5% listed 'not smoking' as another lifestyle factor which may mitigate the risk of bowel cancer. Other diet and lifestyle choices that participants recalled as protective included maintaining a healthy weight/body mass index (BMI) (7.5%), no/limited processed food in the diet (13%), drinking adequate fluids (15.6%) and managing stress levels (3.2%).

When assessing prompted awareness of risk factors, results indicated 51.2% agreed or strongly agreed that being over 70 years old is a risk factor, however 39.3% were unsure. A high percentage of participants correctly agreed or strongly agreed that being overweight may increase the chance of bowel cancer (52.3% and 27.2% respectively). Moreover, of the 79.5% who agreed/strongly agreed, the majority (60.6%) also agreed that the location of fat in the body is also important. A minority of participants agreed or strongly agreed that eating red and processed meat once a day or more (43.4% and 27.7% respectively) and having a diet low in fibre (42.2% and 34.4% respectively) are risk factors for developing the malignancy. Participants accurately agreed or strongly agreed that eating less than five portions of fruit and vegetables a day (48.6% and 14.5% respectively) and doing less than 30 minutes of physical activity per week (50.6% and 19.4% respectively) are also risk factors. Participants were aware that drinking more than 1 unit of alcohol a day (47.1% agreed and 12.4% strongly agreed) may increase the risk however nearly one quarter remained unsure (24.9%). Participants were less aware of other risk factors including eating less than three portions of dairy a day, with 54.3% being unsure if it increased the chance of bowel cancer and a further 31.8% erroneously disagreeing. A high percentage of participants (63.9%) stated they were 'not sure' that having diabetes can increase a person's chance of developing bowel cancer.

Among participants who were HCP/S, the most well recalled protective diet and lifestyle choices were an active lifestyle/exercise (65%), a diet rich in fibre (64.1%) and abstaining from alcohol/consuming alcohol within current recommendations (42.7%). However less than one third recalled a healthy weight/BMI (21.4%) and no/low consumption of red and processed meat (23.3% and 12.6%, respectively) as protective choices.

For HCP/S, the majority agreed or strongly agreed that having a diet low in fibre (91.3%), having a close relative with bowel disease (86.4%), being overweight (86.4%) and eating less than five portions of fruit and vegetables a day (79.6%) were risk factors for developing bowel cancer. A high percentage of HCP/S were unsure whether eating less than three portions of dairy a day is a risk factor and nearly one third disagreed (43.7% and 32% respectively). Over a third (39.8%) of HCP/S participants agreed or strongly agreed that having diabetes is a risk factor, however 44.7% remained unsure.

3.3 Warning signs and symptoms:

Awareness of signs and symptoms was also measured using two items, unprompted and prompted. The results are presented in **Graph 1**:

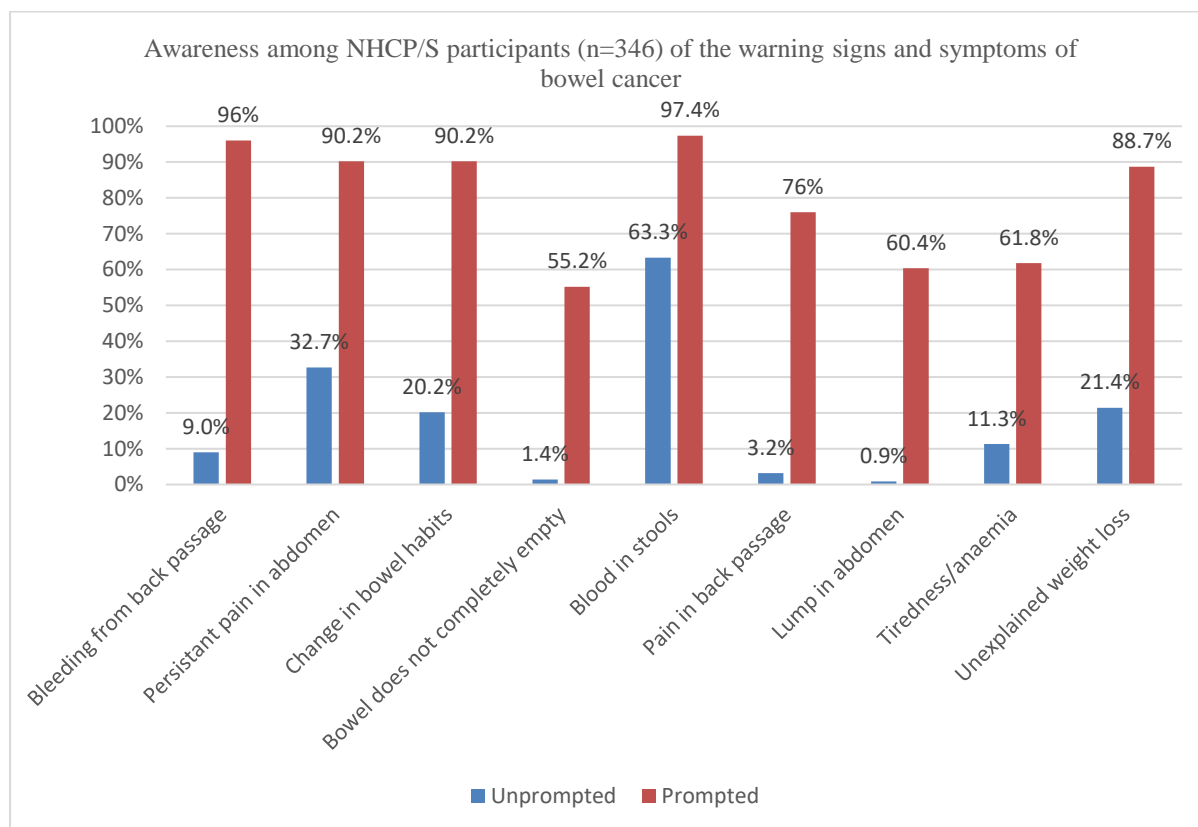
Unprompted awareness of warning signs and symptoms of bowel cancer was very poor, with average recall of less than three signs and symptoms for both groups of participants (NHCP/S: mean 2.3; SD 2.3 and HCP/S: mean 2.5; SD 1.6). Amongst NHCP/S, the most well-recalled symptoms were 'blood in stool' mentioned by 63.3%, followed by 'pain in abdomen' (32.7%). The most recalled number of signs and symptoms was seven, however only 1.4% achieved this. Notably, constipation, bloating and unspecified pain were mentioned by 17.6%, 14.5% and 15.9%, respectively.

Participants' (NHCP/S) awareness of signs and symptoms was higher for prompted compared to unprompted with over 90% of participants agreeing that 'bleeding from the back passage', 'pain in the abdomen', 'change in bowel habit' and 'blood in stool' could be signs/symptoms of bowel cancer. However, less well-recognised symptoms included 'tiredness/anaemia' (61.8%), 'feeling bowel does not completely empty' (55.2%), 'pain in back passage' (76%) and 'lump in the abdomen' (60.4%).

Among participants who were HCP/S, the most well recalled symptoms were 'blood in stool' (66%), a 'change in bowel habit' (48.5), 'unexplained weight loss' (43.7%) and 'pain in the abdomen' (39.8%). Less well identified signs and symptoms included 'feeling bowel does not completely empty' (72.8%), 'pain in back passage' (79.6%) and 'lump in abdomen' (74.8%) compared to all other signs and symptoms, which were recognised by over 85%.

A high percentage of NHCP/S participants (68.5%) had a cumulative knowledge score of 7 or above, indicating awareness of bowel cancer warning signs and symptoms, while 31.5% had a score of 6 or less.

Graph 1: Awareness of warning signs and symptoms of bowel cancer as per CAM questionnaire



3.4 Confidence in recognising a symptom and help-seeking:

Following this, when NHCP/S participants were asked ‘How confident are you that you would be able to notice a bowel cancer symptom?’, 43.4% said they would be ‘fairly confident’, with 2.9% being ‘very confident’, however more than a third (38.7%) reported they would be ‘not very confident’ and 15% were ‘not at all confident’ in recognising a symptom. For HCP/S, nearly two thirds (63.1%) reported they would be ‘fairly confident’ and 5.8% said they would be ‘very confident’, leaving 29.1% ‘not very confident’ and 1.9% ‘not at all confident’.

Participants were asked if they had a symptom, they thought may be a sign of bowel cancer, how soon would they contact their GP to discuss it. The results are presented in **Table 2. 102** (79 NHCP/S and 23 HCP/S) responses were excluded from the analysis due to the inability to code these numerically. Most NHCP/S respondents (63.6%) would contact a doctor within 2 weeks, combining the responses for immediately, as soon as possible and within 1 and 2 weeks.

Table 2: How soon a participant would contact their GP following recognition of a possible symptom.

	NHCP/S participants %(n=267)	HCP/S participants %(n=80)
Immediately/straight away	26 (90)	28.2 (29)
Within 1 week	9 (31)	16.5 (17)
Within 2 weeks	14.7 (51)	12.6 (13)
1 month	7.2 (25)	8.7 (9)
2 months	3.2 (11)	0
3 months +	3.2 (11)	1.9 (2)
As soon as possible (ASAP)	13.9 (48)	9.7 (10)

3.5 Bowel cancer statistics:

Excluding HCP/S, in response to the question ‘In relation to all cancer, how common is bowel cancer in men in Ireland?’ Only 25.1% correctly stated 2nd. Asking the same question in relation to all women in Ireland, 26.9% correctly identified this cancer to be the 3rd most common.

Around one third (33%) of HCP/S identified the correct answer for both statements.

3.6 Total knowledge score:

The average total knowledge score for NHCP/S was 15 of a possible 25 (mean 15.4; SD 3.6). HCP/S had better knowledge scores than their NHCP/S counterparts. For example, 14.6% of HCP/S scored 20 compared to 7.2% of those not in this field.

3.7 Screening:

In the final section of the questionnaire, those who are currently or were previously eligible for BowelScreen Ireland were asked if they had received a test in the past. Only 30 of the 449 respondents had ever received a test and, of these, 29 had completed it.

4.0 Discussion

Awareness of bowel cancer, among Irish residents (NHCP/S), was low as evidenced by a mean total knowledge score of 15 out of a possible 25. However, examining the different areas of awareness, knowledge gaps are evident.

Awareness of signs and symptoms of bowel cancer was low overall with participants recalling on average, two warning signs/symptoms. There was particularly low awareness among NHCP/S, of ‘feeling bowel does not completely empty’ and a ‘lump in the abdomen’, two key messages for bowel cancer, however these signs may be viewed to be not as alarming as other signs such as blood in the stool, a sign both well recalled and recognised by this study population.

Prompted awareness of CRC symptoms and risk factors was much higher than unprompted awareness. This is in line with previous research [4-5, 43-44]. It could be argued, for warning signs and symptoms, that recognising a symptom is more beneficial than recalling a symptom when the ability to identify a symptom is required to act.

In the present study, for NHCP/S, the most well recalled protective diet and lifestyle choices were active lifestyle/exercise (62.1%) and a fibre rich diet (45.4%). However, others were mentioned less such as no/low red meat (10.7%) and no/low processed meat consumption (4.9%). Prompted awareness of risk factors was better with 76.6% and 71.1%, respectively, recognising a low fibre diet and eating red and processed meat. Most respondents (54.3%) were unsure and nearly a third (31.8%) disagreed that eating less than three portions of dairy a day may increase bowel cancer risk. The WCRF report there is ‘‘strong probable’’ evidence that dairy products decrease the risk of this cancer [17]. There is uncertainty regarding the health consequences of dairy products in the public, heightened by claims made on social media and reflected in the increased popularity of plant-based milks. There is evidence that is ‘suggestive’ of an increased risk of prostate cancer with the consumption of dairy products [17]. However, for breast cancer, the WCRF concluded evidence is non-conclusive [17]. Therefore, this finding may reflect confusion in Irish residents, due to dairy being associated with cancer risk both positively and negatively, requiring a closer look at how dairy products are portrayed with regard to specific cancers. It would also be valuable to examine the awareness of dietary risk factors along with dietary intake to investigate if knowledge is reflected in behaviour. For example, the awareness of the risks associated with eating red and processed meat and the daily intake of these foods.

Although we did not evaluate knowledge based on education, a large percentage (82.6%) of respondents had completed a third-level degree. Further research is necessary to evaluate the knowledge of bowel cancer among less educated groups because these groups often have lower knowledge and higher risks of chronic diseases.

Age is one of the strongest risk factors for bowel cancer. In the present study, among NHCP/S, over half the respondents (51.2%) were aware that being over 70 years is a risk factor, however more than one third (39.3%) remained unsure. Similarly, the majority of NHCP/S participants (56.1%) were correctly aware that reaching an age of 60 increases the risk, however nearly one third (32.7%) believed bowel cancer is unrelated to age. This has improved in comparison to earlier Irish studies, among Irish patients. Harewood et al. (2008) [7] reported only 9% were aware of the increasing risk associated with age. More recently, McVeigh, Lowery, Waldron, Mahmood and Barry (2013) [8] found that 29% of patients identified age as a risk factor. Age continues to be underrepresented in mass media [45]. It is important that future bowel cancer awareness campaigns highlight to older adults their heightened risk, particularly as awareness is linked with help-seeking.

While older adults are at increased risk for this cancer and should be alert to potential symptoms, recent studies report increasing incidence of CRC in young adults [46-53]. Moreover, young people could achieve the greater risk reduction, as diet and lifestyle choices by these individuals could significantly impact their cancer risk later in life. It was not possible to run comparisons between younger and older participants, therefore further research is necessary to determine this and in turn inform public health campaigns.

The majority of NHCP/S participants were 'fairly confident' they would be able to recognise a bowel cancer symptom. Furthermore, nearly half of respondents (49.7%) would contact their GP in 2 weeks or less, and a further 13.9% as soon as possible, after noticing a symptom. These are encouraging findings, as a period of more than 2 weeks is considered as a delay [54-55]. Future research should explore the reasons why Irish adults wait longer to speak with a medical professional when a symptom presents.

The data collection for this survey took place during April, the designated bowel cancer awareness month, in which, media campaigns took place concurrently. While we did not correlate this, some areas of awareness, such as recalled warning signs/symptoms, remained low. On one hand, assuming the national campaigns had a positive impact on Irish adults' bowel cancer awareness, the knowledge of this sample may be over representative of Irish residents. However, on the other hand, the campaigns may have had a lesser affect in raising awareness for certain signs and symptoms, as discussed. To the best of our knowledge, no research regarding the evaluation of Irish bowel cancer public campaigns has been published. It would be valuable to

investigate the changes in public awareness after bowel cancer awareness month and its associated campaigns, as has been previously studied in the United Kingdom [44, 56-57].

Certain limitations of this study should be noted. Firstly, there was an imbalance of sexes with only 26.5% of the participants being men. However, women report more willingness to participate in health research and previous studies have consistently shown higher levels of awareness among women compared with men [58]. Men may be reluctant to discuss bowel health and furthermore, this gender appears to be less likely to take part in screening [38, 40]. It may also be owing to the online design of this study, suggesting men may be less engaged with this type of recruitment. Workplace recruitment has proved successful in recruiting men, in particular a sub-group of men, Irish farmers, at cattle markets [59-60]. While this study was in relation to cardiovascular disease, the accessible, place of recruitment, not likened to a healthcare setting, engaged this historically challenging group in healthcare research. Further research on knowledge and attitudes of men is important and would help inform public health campaigns. Secondly, most respondents were <50 years (72.7%). Therefore, it was not possible to run comparisons between those >50 and <50 years. Thirdly, among surveyed participants, only 6.7% of the participants responded to the screening section of the questionnaire, with only one individual not taking part in screening. Consequently, we could not determine reasons for not engaging in screening as these individuals did not engage with this type of research. It is possible that respondents who took part in BowelScreen Ireland, are more motivated regarding research participation and therefore further research, of different design, is required as screening participation remains disappointingly low in Ireland [1-2]. Finally, over 80% of the overall sample had completed a high level of education. This is considerably higher than the central statistics office (CSO) educational attainment thematic report, in which 53% of 25–64 year-olds had a third level education, in 2021 [61]. This suggests that knowledge gaps may be even more evident among the Irish people of lower education level. Further, more targeted research, across a representative sample, including an adequate number of Irish males and older adults of lower education level is required to understand, presumably wider bowel cancer knowledge gaps compared to our sample.

5.0 Conclusion

The results of the present study demonstrate that Irish residents have a fair overall knowledge of bowel cancer however, specific warning signs, symptoms and risk factors require attention. Nearly half of Irish residents are 'not very' or 'not at all confident' with recognising a symptom of this cancer.

Bowel cancer is underrepresented in the media and discussion of this cancer is often avoided. Targeted health campaigns across all mass media, will offer a sustainable means of increasing awareness and screening uptake, and reducing the national bowel cancer burden in Ireland.

Statements and declarations

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Conflict of Interest: The authors declare that they have no conflict of interest.

Consent to participate: Informed consent was obtained from all individual participants included in the study.

Ethical approval: This study was performed in line with the principles of the declaration of Helsinki. Approval was granted by the ethics committee of the University of Chester Faculty of Medicine and Life Sciences Research Ethics Committee (frec@chester.ac.uk) (10/12/20; 1696/20/LF/CSN).

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