

## RESEARCH ARTICLE

# Knowledge and Perceptions about Colorectal Cancer in Jordan

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### Abstract

**Background:** Colorectal cancer (CRC) is the third most common cancer globally. In Jordan, it is the number one cancer among men and the second most common cancer among women, accounting for 15% and 9.4% respectively of all male and female diagnosed cancers. This study aimed to evaluate the knowledge and perceptions about colorectal cancer risk factors, signs and symptoms in Jordan and to provide useful data about the best modes of disseminating preventive messages about the disease. **Materials and Methods:** A stratified clustered random sampling technique was used to recruit 300 males and 300 females aged 30 to 65 years without a previous history of CRC from four governorates in Jordan. A semi-structured questionnaire and face to face interviews were employed. Descriptive and multivariate analysis was applied to assess knowledge and perceptions about CRC. **Results:** Both males and females perceived their CRC risk to be low. They had low knowledge scores about CRC with no significant gender association ( $P=0.47$ ). From a maximum knowledge score of 18 points, the median scores of males and females were 4 points ( $SD=2.346$ , range 0-13) and 4 points ( $SD=2.329$ , range 0-11) respectively. Better knowledge scores were associated with governorate, higher educational level, older age, higher income, having a chronic disease, having a family history of CRC, previously knowing someone who had CRC and their doctor's knowledge about their family history of CRC. **Conclusions:** There is a low level of knowledge about CRC and underestimation of risk among the study participants. This underlines the need for public health interventions to create awareness about the illness. It also calls for further research to assess the knowledge and perceptions about CRC early detection examinations in Jordan.

**Keywords:** Colorectal cancer - risk factors - signs and symptoms - knowledge - perceptions - Jordan

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### Introduction

Colorectal cancer (CRC) is the third most common cancer globally (Ferlay et al., 2015). It is also the fourth most common cause of cancer mortality worldwide, following lung, liver and stomach cancer. In 2012 there were 1.4 million new CRC cases (Ferlay et al., 2015) and 694000 deaths worldwide. Incidence rates of CRC are higher in men than in women in the majority of countries worldwide (Torre et al., 2015). Globally, CRC constitutes 9.2% (746,000 cases) of all men cancers and ranked third after lung and prostate cancers. At the same time, CRC constitutes 10% (614,000 cases) of all women cancers and is ranked second after breast cancer (Ferlay et al., 2015).

Although 55% of the CRC cases occur in high-income-countries, more deaths (52%) occur in low and middle-income-countries, which reflects a poorer survival in poorer countries (Ferlay et al., 2015). It is predicted that by the year 2035, 2.4 million new cases of CRC will be diagnosed annually worldwide; 1.36 million new cases for men and 1.08 million for women (Ferlay et al., 2015). Globally, there was nearly 46% increase in CRC

mortality between 1990 (490,000 deaths annually) and 2010 (715,000 deaths) (Lozano et al., 2012). In the US, the average lifetime risk of developing CRC is about one in 20 (Howlader N, 2013). Based on the literature, CRC risk and mortality can be reduced through primary prevention strategies, such as changing dietary behaviors or increasing physical activity, and secondary prevention strategies, such as screening and early detection of cancerous polyps (Johnson et al., 2013).

Based on 2010 Jordan's National Cancer Registry report (Tarawneh et al., 2010), CRC is the second most common cancer among both sexes in Jordan. It constitutes 12% of all cancer cases in the kingdom. It is the number one cancer among men and the second most common cancer among women, comprising 15% and 9.4% of all males and females diagnosed cancers respectively (Tarawneh et al., 2010). The median age of diagnosis of CRC in Jordan is 61 years for both sexes. Specifically, 64 and 59 years for colon cancer in males and females in that order (Tarawneh et al., 2010). As for the cancer of the rectum, the median age of diagnosis is 62 years for males and 57 for females.

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In 2010, the overall crude incidence rate of CRC in Jordan was 9.1 per 100,000 of the population; 11 per 100,000 in males and 7.6 per 100,000 in women (Tarawneh et al., 2010). The overall age standardized incidence rate (ASIR) of CRC in Jordan is 17 per 100,000. There were progressive increases in ASIR and male to female ratio of CRC over the years. The ASIR was 11.5 and 11.1 per 100,000 for males and females respectively in 1996 and increased in 2009 to 18.2 and 16.5, per 100,000 and in 2010 it became 20 per 100,000 among males and 14 per 100,000 for females. Colorectal cancer was the second cause of death by cancer in 2009, with 235 deaths reported. This represents 13.3% of all cancer deaths (10.6% in males and 11.2 % in females).

Recently, CRC began to receive more attention as a health problem in Jordan that needs to be addressed through creating public awareness about the disease, preventive measures, screening and early detection. Thus, this study aims to evaluate the knowledge and perceptions about colorectal cancer risk factors, signs and symptoms in Jordan. This is important for designing effective national campaigns to improve the awareness about CRC. We also hope that the results of this survey will provide useful data about the best modes of disseminating colorectal cancer preventive messages in Jordan.

## Materials and Methods

### Study setting

Jordan is an upper middle income country (WB, 2015). In 2013 the average GDP per capita was 5159 USD (DoS, 2013). The kingdom is divided into 12 governorates within three administrative regions: the north, middle, and south. The registered population is 6.6 million; 83% live in urban areas and 17% in rural parts (DoS, 2013). The annual growth rate of the population is 2.2% and based on that it is expected that the population will double within 32 years (DoS, 2013). The life expectancy for women is 76.7 years and for men 72.7. All children receive ten years of compulsory basic education which is free of charge. The Illiteracy rate among population aged 15 years and above is 6.8%; specifically 3.7% among males and 10.1% among females.

### Study design

This study was conducted during October 2014. Stratified clustered random sampling (SCRS) technique was applied. SCS is a multistage sample design that has a margin of error ranging between 2-5%. The population frame in Jordan is divided into three stratum, the rural areas, urban areas and administrative areas. The sample was drawn with proportional distribution between stratum taking into account the weight (size) of each stratum.

The clusters were selected using multi-stage systematic sampling technique from the master sample based on the census 2004 that was updated in 2012 (DoS, 2012). To ensure the spread of the primary sampling units (PSUs) in the northern, central and southern region, the PSUs within each stratum were arranged according to geographical location. The total sample size in this study was 600 randomly selected participants. One from each of the

600 randomly selected households in four governorates (Amman 370, Zarqa 90, Irbid 100 and karak 40). The sample was divided into 300 males (50%) and 300 females (50%).

### Study participants

The inclusion criteria were healthy Jordanian man or woman aged 30 - 65 years with no previous history of CRC cancer. The median age of females was 44 years and 43 years for the males. Table 1 describes the socio-demographic characteristics of the study participants. There were no significant differences between the men and women except in education levels (P= 0.001) and work status. Men were more educated than women and 78% of the women were housewives (P= 0.001). This is consistent with the national statistics that indicates that the percentage of participation of Jordanian women in the Labour Force is 13% (DoS, 2013).

### Measurement instrument

The survey was carried out by using a semi-structured questionnaire (SSQ). The SSQ was developed by the research team based on literature review. After that it was validated and adjusted based on forty pilot interviews; specifically: ten in each governorate; twenty with men and twenty with women. The questionnaire covered information on the socio-demographic characteristics including the participants' reported weight and height, social, economic and literacy status. This was followed by questions to explore the participants' sources of health information; their perceptions about CRC, their knowledge about CRC epidemiology in Jordan, risk factors, signs and symptoms.

### Data collection

The data was collected via face-to-face interviews. Each interview lasted 30 to 40 minutes. Forty eight experienced interviewers and 12 field supervisors were recruited to collect the data (50% males and 50% females). Male interviewers interviewed male participants and female interviewers interviewed women. The data collections teams attended two full days training to make sure that all are on the same line of understanding of the questionnaire and the sampling methodology. The supervisors monitored the data collection in the field, did quality checks on the data and provided assistance. Each team in the field consisted of 4 interviewers and 1 field supervisor and covered 20 houses per day (2 blocks). Each interviewer filled 5 questionnaires on average per day. An experienced field work manger conducted daily visits to the field to make sure that everything is running smoothly and assist the field supervisors whenever is needed. The data quality control team chose randomly 10% of the questionnaires and conducted phone calls to the respondents and asked them few questions from the questionnaire to make sure that nothing is missing and double check the answers. A special data entry software (CsPro) was used in entering the data, this software guarantee that there are no data entry errors through logical and constrains on cells entry.

**Ethical issues**

The ethical approval of this study was granted from the Jordan University Medical Research Ethical Review Board. The participants were informed about the purpose of the study, the voluntary nature of their participation and their right to access the findings. They had full autonomy to withdraw at any time without giving a reason. Confidentiality of the data was ensured and a verbal consent was sought from all participants.

**Statistical methods**

Data analysis was carried out using SPSS 20. The level of statistical significance was set at 0.05. The PI conducted descriptive data analysis to describe the study participants. There were five open ended CRC knowledge questions, the answers were coded as correct or incorrect and each correct answer was given the weight of one point from a maximum of 18 points. The number of correct answers were summarized and categorized into three levels: 0-4, 5-8, and ≥9. Chi-square and Fisher’s exact tests were used to assess the association between background characteristics and the knowledge scores; in addition they were used to test the association between the perceptions about CRC cancer and sex. The difference between the proportion of males and females correct answers was analyzed using independent samples t-test.

**Knowledge scores**

Both males and females scored low in the knowledge test and there were no significant (P= 0.47) differences between them in the overall knowledge scores. From a maximum knowledge score of 18 points, the median knowledge scores of males was 4 points (SD = 2.346, Range 0-13). While for women the median knowledge score was also 4 points (SD= 2.329, Range 0-11). Table 3 shows the percent correct answers to the five open ended knowledge questions. For the first question: What is the most common cancer among men in Jordan? Answering this question correctly gave the participant one point. Men scored significantly higher than women in this question (P value=0.001). Only 6.3% of the women answered correctly that it is CRC compared to 14% of correct answers among men. Twenty three percent of the males and 46% of the females answered wrongly that the most common cancer among males in Jordan is prostate cancer. While 19% of the males and 14% of the females thought it is lung cancer. For the second question: What is the most

**Results**

*Sources of health information*

The majority (66%) of the participants indicated that

**Table 1. Socio-Demographic Characteristics of the study Population**

|                          | Male (n=300) | Female(n=300) | Total (n=600) | P-value |
|--------------------------|--------------|---------------|---------------|---------|
| Age (year) Mean ± SD     | 44.6 ± 10.4  | 45.1 ± 9.8    | 44.1 ± 10.1   | 0.58    |
| BMI mean ± SD            | 27.5 ± 5.22  | 28.22 ± 5.35  | 27.83 ± 5.29  | 0.08    |
|                          | n (%)        | n (%)         | n (%)         |         |
| Age group (years)        |              |               |               | 0.68    |
| 30-40                    | 124 (41)     | 115 (39)      | 239 (40)      |         |
| 41-50                    | 91 (30)      | 100 (33)      | 191 (32)      |         |
| 51-65                    | 85 (28)      | 85 (28)       | 170 (28)      |         |
| Age groups               |              |               |               |         |
| BMI Mean ± SD            |              |               |               |         |
| 30-40 years              | 27.1 ± 4.63  | 26.3 ± 4.81   | 26.7 ± 4.72   | 0.68    |
| 41-50 years              | 28.3 ± 6.21  | 28.6 ± 5.53   | 28.5 ± 5.85   | 0.26    |
| 51-65 years              | 27.1 ± 4.79  | 30.4 ± 4.92   | 28.7 ± 5.11   | 0.81    |
| Educational level        | n (%)        | n (%)         | n             |         |
| Below secondary          | 99 (33)      | 116 (39)      | 215 (36)      | 0.001   |
| Secondary                | 103 (34)     | 108 (36)      | 211 (35)      |         |
| College (diploma)        | 28 (9.4)     | 43 (14)       | 71 (12)       |         |
| University and higher    | 69 (23)      | 34 (11)       | 103 (17)      |         |
| Monthly household income | n (%)        | n (%)         | n (%)         |         |
| Below 500 JD             | 212 (71)     | 219 (73)      | 431 (72)      | 0.13    |
| 500-1000 JD              | 71 (24)      | 77 (26)       | 148 (25)      |         |
| 1000-1500                | 9 (3)        | 4 (1.3)       | 13 (2.2)      |         |
| More than 1500           | 4 (1.3)      | 1 (0.3)       | 5 (0.8)       |         |
| Did not answer           | 3 (1)        | 0 (0)         | 3 (0.5)       |         |
| Work status              | n (%)        | n (%)         | n (%)         |         |
| Full time Job            | 194 (65)     | 31 (10)       | 225 (38)      |         |
| Part time Job            | 36 (12)      | 11 (3.7)      | 47 (7.8)      |         |
| Housewife                | 0 (0)        | 234 (78)      | 234 (39)      |         |
| Unemployed               | 69 (23)      | 25 (8.3)      | 94 (16)       |         |

common cancer among women in Jordan? Answering this question correctly gave the participant one point. The majority of men and women knew that breast cancer is the most common cancer among women in Jordan with 82% and 86% of correct answers respectively (P=0.185). While 7.3% of the men and 10 % of the women thought that it is Uterus cancer. For the third question: Which part of the body is affected by CRC? Answering this question correctly gave the participant one point. More than half of the participants answered correctly that it affects the colon and the rectum with no significant difference between males and females (P=0.870). For the fourth question: What are the risk factors of colorectal cancer? The participant received one point if he/she mentioned correctly one of the following risk factor that we extracted from the literature (Ferrari et al., 2007; Botteri et al., 2008; WCRFGN, 2011; Johnson et al., 2013; ACS, 2015b; NCI, 2015; Torre et al., 2015): Smoking; Hereditary risk or family history of colonic polyps or CRC; Personal history of inflammatory bowel disease or CRC; Diet low in fibre; Diet rich in red meat or processed meat; Obesity; Lack of exercise or sedentary life style; Age  $\geq$  50 years, and Excessive alcohol intake. To get a maximum score of 9 for this question, the participant was supposed to know all of the above risk factors. There was no significant differences

in risk factors knowledge score between the male and female participants (P= 0.284). Forty five percent of the males and 46% female participants had no knowledge or did not remember any of the CRC risk factors; 34% of the males and 28% of the women knew one risk factor; 14% of the men and 21% of the women knew two risk factors; and only 6.3% of the men and 6% of the women knew three to five risk factors. None of the participants knew the following CRC risk factors: Obesity; Lack of Exercise and sedentary life style, Age  $\geq$  50 years and Excessive alcohol intake.

For the fifth question: What are the signs and symptoms of colorectal cancer? The participant received one point if he/she mentioned correctly one of the signs and symptoms that are listed in table 2 with a maximum score of 7 points. These signs and symptoms were based on the American Cancer Society guidelines (ACS, 2015a). There was no significant differences in signs and symptoms knowledge between the male and female participants (P= 0.210). Generally the level of knowledge about the CRC signs and symptoms was low among the study participants: 65% of the males and 66% of the females had no knowledge; 17% of the males and 14% of the females knew only one of signs and symptoms; 10 % of the males and 10% of the females knew two, while only 7.6 % of the males and

**Table 2. Sources of Health Information in General**

|   | Male |    | Female |     | Total |     |
|---|------|----|--------|-----|-------|-----|
|   | n    | %  | n      | %   | n     | %   |
| Main sources of health knowledge ( n=600) |      |    |        |     |       |     |
| TV  | 171  | 57 | 227    | 75  | 398   | 66  |
| Internet                                  | 99   | 33 | 72     | 24  | 171   | 29  |
| Newspaper                                 | 30   | 10 | 15     | 5   | 45    | 7.5 |
| Scientific articles                       | 18   | 6  | 9      | 3   | 27    | 4.5 |
| Other sources of Knowledge (n=105)        | 49   | 16 | 56     | 19  | 105   | 18  |
| -Family, Friends, neighbors, coworkers    | 20   | 41 | 20     | 36  | 40    | 38  |
| -Health facility (brochures)              | 7    | 14 | 21     | 38  | 28    | 27  |
| -Health center visits                     | 13   | 27 | 11     | 20  | 24    | 23  |
| -Others: (radio, workshop, advertisement) | 9    | 18 | 4      | 7.1 | 13    | 12  |

**Table 3. Percentage of Correct Answers on the Knowledge Questions**

| Question   | Percentage of correct answers |               |
|--|-------------------------------|---------------|
|  | Male                          | Female        |
|  | (n= 300)<br>%                 | (n= 300)<br>% |
| What is the most common cancer among men in Jordan?  | 14                            | 6.3           |
| What is the most common cancer among women in Jordan?  | 82                            | 86            |
| Which part of the body is affected by colorectal cancer?   | 54                            | 54            |
| What are the risk factors of colorectal cancer?  |                               |               |
| Smoking  | 23                            | 20            |
| Hereditary risk or family history of colonic polyps or CRC   | 14                            | 18            |
| Personal history of inflammatory bowel disease or colon cancer   | 14                            | 18            |
| Diet Low in fiber  | 18                            | 15            |
| Diet rich in red meat or processed meat  | 12                            | 11            |
| What are the signs and symptoms of colorectal cancer   |                               |               |
| A change in bowel habits, such as diarrhea, constipation, or narrowing of the stool, that lasts for more than a few days | 15                            | 16            |
| Weakness and fatigue   | 14                            | 16            |
| Blood in the stool which may make it look dark   | 11                            | 10            |
| Unintended weight loss   | 7.0                           | 11            |
| Cramping or abdominal (belly) pain   | 7.0                           | 8.6           |
| A feeling that you need to have a bowel movement that is not relieved by doing so  | 5.3                           | 4.3           |

**Table 4. Colorectal Cancer Knowledge Scores**

|   | Scored 0-4 |     | scored 5-8 |    | scored $\geq 9$ |     | P-value |
|---|------------|-----|------------|----|-----------------|-----|---------|
|   | n          | %   | n          | %  | n               | %   |         |
| Sex   |            |     |            |    |                 |     | 0.66    |
| Male  | 183        | 61  | 112        | 37 | 5               | 1.7 |         |
| Female  | 190        | 63  | 103        | 34 | 7               | 2.3 |         |
| Age groups  |            |     |            |    |                 |     | 0.03    |
| 30-40   | 167        | 70  | 67         | 28 | 5               | 2.1 |         |
| 41-50   | 111        | 58  | 76         | 40 | 4               | 2.1 |         |
| 51-65   | 95         | 56  | 72         | 42 | 3               | 1.8 |         |
| Monthly income  |            |     |            |    |                 |     | 0.00    |
| less than 500 jds   | 291        | 68  | 132        | 31 | 8               | 1.9 |         |
| 500-1000  | 72         | 49  | 74         | 50 | 2               | 1.4 |         |
| more than 1000  | 10         | 48  | 9          | 43 | 2               | 9.5 |         |
| Governorate   |            |     |            |    |                 |     | 0.00    |
| Amman   | 201        | 54  | 161        | 44 | 8               | 2.2 |         |
| Zarqa   | 69         | 77  | 18         | 20 | 3               | 3.3 |         |
| Irbid   | 73         | 73  | 26         | 26 | 1               | 1   |         |
| Karak   | 30         | 75  | 10         | 25 | 0               | 0   |         |
| Marital status  |            |     |            |    |                 |     | 0.17    |
| sigle   | 37         | 71  | 14         | 27 | 1               | 1.9 |         |
| married   | 317        | 61  | 193        | 37 | 9               | 1.7 |         |
| Divorced or widow   | 19         | 66  | 8          | 28 | 2               | 6.9 |         |
| body mass index grouping  |            |     |            |    |                 |     | 0.92    |
| Underweight = <18.5   | 8          | 62  | 5          | 39 | 0               | 0   |         |
| Normal weight = 18.5-24.9   | 108        | 66  | 53         | 32 | 4               | 2.4 |         |
| Overweight = 25-29.9  | 127        | 60  | 81         | 38 | 4               | 1.9 |         |
| Obesity = BMI of 30 or greater  | 111        | 62  | 66         | 37 | 3               | 1.7 |         |
| Education levels groups   |            |     |            |    |                 |     | 0.00    |
| Illiterate  | 22         | 82  | 5          | 19 | 0               | 0   |         |
| less than high school   | 139        | 74  | 46         | 25 | 3               | 1.6 |         |
| high school   | 126        | 60  | 78         | 37 | 7               | 3.3 |         |
| College or BSc  | 85         | 57  | 63         | 42 | 2               | 1.3 |         |
| higher diploma or master  | 1          | 4.2 | 23         | 96 | 0               | 0   |         |
| Do you have a chronic illness   |            |     |            |    |                 |     | 0.00    |
| Yes   | 89         | 58  | 57         | 37 | 8               | 5.2 |         |
| No  | 284        | 64  | 158        | 35 | 4               | 0.9 |         |
| Did your doctor ever ask you if you have a family history of colon cancer |            |     |            |    |                 |     | 0.04    |
| Yes   | 9          | 30  | 20         | 67 | 1               | 3.3 |         |
| No  | 240        | 54  | 195        | 44 | 11              | 2.5 |         |
| Do you have a family history of colon cancer                              |            |     |            |    |                 |     | 0.00    |
| Yes   | 12         | 21  | 40         | 69 | 6               | 10  |         |
| No  | 237        | 57  | 175        | 42 | 6               | 1.4 |         |
| Did you ever knew anyone who had colon cancer                             |            |     |            |    |                 |     | 0.00    |
| Yes   | 22         | 24  | 65         | 70 | 6               | 6.5 |         |
| No  | 152        | 52  | 132        | 46 | 6               | 2.1 |         |
| I do not know or do not remember  | 42         | 78  | 12         | 22 | 0               | 0   |         |
| Refused to answer   | 33         | 85  | 6          | 16 | 0               | 0   |         |
| Total   | 373        | 62  | 215        | 36 | 12              | 2   |         |

9.3% of the women knew three to five of the signs and symptoms.

Table 4 shows that 62 % of the study participants scored 0-4 points in the knowledge test, 36% scored 5-8 points and 12% scored  $\geq 9$  points. There was a significant association ( $P \leq 0.05$ ) between better knowledge score level and higher educational level, older age group, higher monthly income, having a chronic disease, having a family history of CRC, previously knowing someone who had CRC and being previously asked by the doctor about CRC family history. Moreover, participants from Amman scored significantly better than participants from other governorates ( $P = 0.00$ ).

#### CRC risk perceptions

There were insignificant differences in CRC risk perceptions between the males and females in this study ( $P > 0.05$ ). Table 4 shows that in this study, despite that 77% of the men and 79% of the women reported that they heard about CRC before, only 3.7% of the males and 5.2% of the females mentioned that they ever had any symptoms that they thought it could be related to colorectal cancer; 1.7% of the males and 2.7% of the females ever consulted a physician because they were worried about colon cancer; 19% of both males or females thought that they could ever get colon cancer in their life time and 64% of the total

**Table 5. Colo-rectal Cancer Risk Perceptions**

|   | Male |      | Female |     | Total |     |
|---|------|------|--------|-----|-------|-----|
|   | n    | %    | n      | %   | n     | %   |
| Did you ever hear about colorectal cancer before  |      |      |        |     |       |     |
| yes   | 231  | 77   | 245    | 82  | 476   | 79  |
| No  | 69   | 23   | 55     | 18  | 124   | 21  |
| Did you ever had any symptoms that you thought it could be related to colorectal cancer |      |      |        |     |       |     |
| Yes   | 11   | 3.7  | 20     | 6.7 | 31    | 5.2 |
| No  | 289  | 96.3 | 280    | 93  | 569   | 95  |
| Did you ever consulted a physician because you were worried about colon cancer          |      |      |        |     |       |     |
| Yes   | 5    | 1.7  | 11     | 3.7 | 16    | 2.7 |
| No  | 295  | 98   | 289    | 96  | 584   | 97  |
| Do you think that you could ever get colon cancer in your life time                     |      |      |        |     |       |     |
| Yes   | 56   | 19   | 56     | 19  | 112   | 19  |
| No  | 28   | 9.3  | 41     | 14  | 69    | 12  |
| No, with God's blessings  | 202  | 67   | 180    | 61  | 382   | 64  |
| I do not know   | 14   | 4.6  | 20     | 6.7 | 34    | 5.7 |

study participants believed that with God's blessing they will not get CRC in their life time.

## Discussion

The results of this study showed that both males and females participants perceived their CRC risk to be low. They had low CRC knowledge scores with no significant association with the participant's sex. Better knowledge scores were associated with higher educational level, older age and having a family history of CRC.

There were insignificant differences in CRC risk perceptions between the males and females in this study ( $P>0.05$ ). Although 77% of the men and 79% of the women reported that they heard about CRC before, only 19% believed that they might get CRC in their life time. This is consistent with the findings of other studies conducted in Jordan; Omran and Ismail (2010) recruited 160 participants aged 50 years and older from the outpatient clinics at two large hospitals in the north of Jordan for a cross-sectional study. They found that Less than half of the participants perceived themselves as susceptible to developing CRC. In another survey study by Omran et al. (2015) with patients attending outpatient gastroenterology clinics in public hospitals throughout Jordan; the results showed that the majority of the participants (68%) underestimated their risk for CRC. Only 27% correctly judged their life time risk while 5% overestimated their risk. In a study by Ahmad and Al-Gamal (2014) that assessed the older Jordanians knowledge about cancer, it was found that the belief of having no health problem made the participants feel safe and not at risk of getting cancer and that was the major reason for not doing routine health check-up.

The results of our study showed that 64% of the participants believed that with God's protection they will not get the disease. Based on the Revised Health Belief Model, perceived seriousness and perceived susceptibility to the illness influence the perceived threat and the consequent health behaviour. Likewise, the perceived benefits and the perceived barriers of actions to be taken

influence the health behaviour. While, general health motivation, self efficacy and confidence of the ability to successfully perform the action enhance preventive health behaviours (Rosenstock, 1990). Fatalistic beliefs about cancer prevention might negatively affect preventive health behaviours (Niederdeppe and Levy, 2007). Based on the literature, the fatalistic beliefs were associated with higher risk of advanced stage of CRC at diagnosis (Beeken et al., 2011; Lyratzopoulos et al., 2015). The belief in God's control of fate and destiny influence the individual perceptions of the value of preventive health behaviours. This might decrease the self-efficacy and lower the motivation to carry out preventive behaviours (Steptoe and Wardle, 2001; Niederdeppe and Levy, 2007).

The participants in this study had low knowledge scores about CRC epidemiology in Jordan, risk factors, signs and symptoms. The low knowledge was not significantly associated with the participant's sex. These results are consistent with the results of Omran et al (2015) and Ahmad and Al-Gamal (2014) which showed a low awareness level about CRC in Jordan and a need for public education about CRC risk factors, signs and symptoms. In that study, only 22 % of participants correctly ranked CRC as the commonest cause of cancer related deaths in Jordan. In contrast, in our results and in Omran et al. (2015) study the participants had good knowledge about breast cancer epidemiology in Jordan and this could be attributed to the public awareness campaigns and interventions of the Jordan breast cancer program (Taha et al., 2010; Taha et al., 2012; Taha et al., 2013; Taha et al., 2014). Conversely, currently there is no national program in Jordan that works to create awareness about the importance of CRC prevention and early detection.

In our study there was lack of knowledge among the participants that obesity and sedentary life style are risk factors of CRC. In a case control study (Arafa et al., 2011) that evaluated the dietary patterns and lifestyle characteristics of 220 recently diagnosed CRC patients in Jordan. It was found that a sedentary lifestyle and a diet low in fruits and vegetables, and high in animal red meat and saturated fat, was significantly associated with CRC. A big study with 20710 participants from 21 European countries showed that the awareness of CRC is low in Europe and that there is a real need for educational programmes (Keighley et al., 2004).

Our results showed that better CRC knowledge among the participants is associated with higher educational level, older age and having a family history of CRC. This is consistent with the results of a study conducted to investigate colorectal cancer (CRC) awareness in healthy individuals in Saudi Arabia with 1070 participants. Although the overall CRC knowledge was low, still, older individuals and those with higher education had higher CRC knowledge scores (Zubaidi et al., 2015). These findings are also in agreement with another study (Osama Al Wutayd, 2015) conducted in Saudi Arabia with 600 participants recruited from the malls in Riyadh city. The study revealed that better knowledge was significantly associated with higher education and with having family history of CRC.

Although we used SCRS technique in this study,

still this study is limited because the sample was taken from four out of a total of twelve governorates in Jordan. However, the randomly drawn sample was representative of the northern, central and southern parts of the country. The strength of this study lies in its design and in the validated data collection instrument that we used. The experienced interviewers in this study asked the participants open ended knowledge questions about CRC and the participants were not given multiple choices that could lead them to the answers. Thus we believe that the results of this study provided a reliable measure of the participants' level of knowledge.

In conclusion, The results of this study provided data about the public's knowledge gaps about CRC in Jordan. We hope that it will be useful for designing interventions that enhances the public awareness and address the barriers of colorectal cancer prevention in Jordan. Colorectal cancer has a good prognosis if detected early and there is a real need for placing CRC prevention and early detection among the public health priorities in Jordan. Additionally, there is a need for further research to assess the knowledge, perceptions and barriers of CRC screening and early detection in Jordan.

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