

## Public awareness of the relationship between smoking and crohn's disease, in Eastern province, Saudi Arabia



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**Abstract**— Crohn's disease (CD) is a chronic inflammatory disease affects the gastrointestinal tract (GI). The Major symptoms of CD are diarrhea, abdominal pain, and weight loss. Smoking is one of the environmental factors that plays important role in CD development and severity. The aim of this study is the aim of this study is to evaluate the knowledge of population about the relationship between crohn's disease and smoking. This is a cross sectional study conducted in Eastern province, Saudi Arabia. Data was collected using multiple choice questionnaire composed of 13 questions assessing individual's risk factors of CD and the awareness of its relation with smoking. The total number of participants enrolled in this study was 904 participants. 84.3% of participants are free of CD, and only thirteen participants (1.4%) are diagnosed with it. The participants were asked about whether they are smokers or not, and most of participants (85.7%) were not smokers.

Data showed that general non-smoker people are aware of the relationship between smoking and CD. On the other hand, most smokers are unaware of the relation between their habit and the disease.

### **Introduction:**

Crohn's disease (CD) is a chronic inflammatory disease affects the gastrointestinal tract (GI). It can affect any part of GI tract from mouth to anus. The exact etiology of the diseases is unknown. However, studies have clearly found that the interaction between environmental factors, intestinal microorganism, and host's immune response in genetic susceptible individuals contribute to the development of the disease (1).

Regarding the incidence of CD in Saudi Arabia, studies initially reported the incidence of CD to be (0.32/100,000 population) in Saudi Arabia in 1982 (2), since then the incidence of CD has been increasing dramatically. The increasing number of patients with CD over the last two to three decades is attributed to the changes in environmental factors like consumption of nicotine, nutrition, and other risk factors (3).

The Major symptoms of CD are diarrhea, abdominal pain, and weight loss. In addition, anal and perianal complications like anal fissure, fistula, and perianal abscess are complications found in patients with CD disease (1). the course of the disease in terms of severity is variable. This variability suggests an influence of environmental factors (4).

Smoking is one of the environmental factors that plays important role in CD (5). In 1984, they concluded that smoking has an impact in the development of the disease (6). In 1990, a study concluded that the relative risk of CD is increased in those who exposed to tobacco smoke during childhood (7).

Furthermore, many studies have shown that smokers are more likely to have a relapse and recurrence of the disease. In 1994, the result of a study shown that smoking was the only significant predictor of surgical recurrence in patients who underwent a surgery for CD (8). In addition, they found that the site of CD has been associated with the duration of smoking habit, signifying that small bowel and ileocolonic disease are more common in heavy smokers. (5,9)

People awareness in association between CD and smoking is an essential component in prevention and management of the disease(2). Shields. PL, and Low-Ber. TS. (1996) assessed patients and physician's awareness and concluded that physicians and their patients of CD lack the knowledge about smoking effects on the disease. Adversely, in 2012 a study was carried out in Ireland, result shown that patients especially smoker ones are aware of this link (4). However, recent data on the awareness is limited. Therefore, the aim of this study is to evaluate the knowledge of population about the relationship between crohn's disease and smokers.

### **Method:**

This is a cross sectional study conducted in Eastern province, Saudi Arabia. Targeted population will be both males and females who live in the Eastern region. Sample size is 904 calculated by OpenEpi, Version 3(10). Data was collected using multiple choice questionnaire composed of 13 questions assessing individual's risk factors of crohn's disease and the awareness of its relation with smoking. It was distributed online, and provided in Arabic language.

All adult people who are aged between 20 and 45, living in Al-Hassa, and agreed to participate were included. However, people who live outside, refuse to participate were excluded. The questionnaire was distributed and collected during the period of May to July 2020. The entry and analysis of data were done by using the Statistical Package for the Social Science (SPSS, version 27). Comparative analysis was performed by using Chi-square for qualitative variable and T test or Anova for comparing the mean as applicable.

### **Ethical consideration:**

This study followed all the ethical considerations. The approval was taken from King Faisal University, Saudi Arabia and a consent was taken from each participant with clarifying the aim of the study and assuring the confidentiality of provided information.

### **Results:**

#### **Study participants:**

There is a total of 984 participants in this study. However, as this study aimed to study the awareness of people about the relationship between smokers CD in Eastern Region, 80 participants were excluded as they were from other regions. For that reason, the total number of participants from Eastern regions become 904 participants. Figure 1 is demonstrating the distribution of participants among age groups.

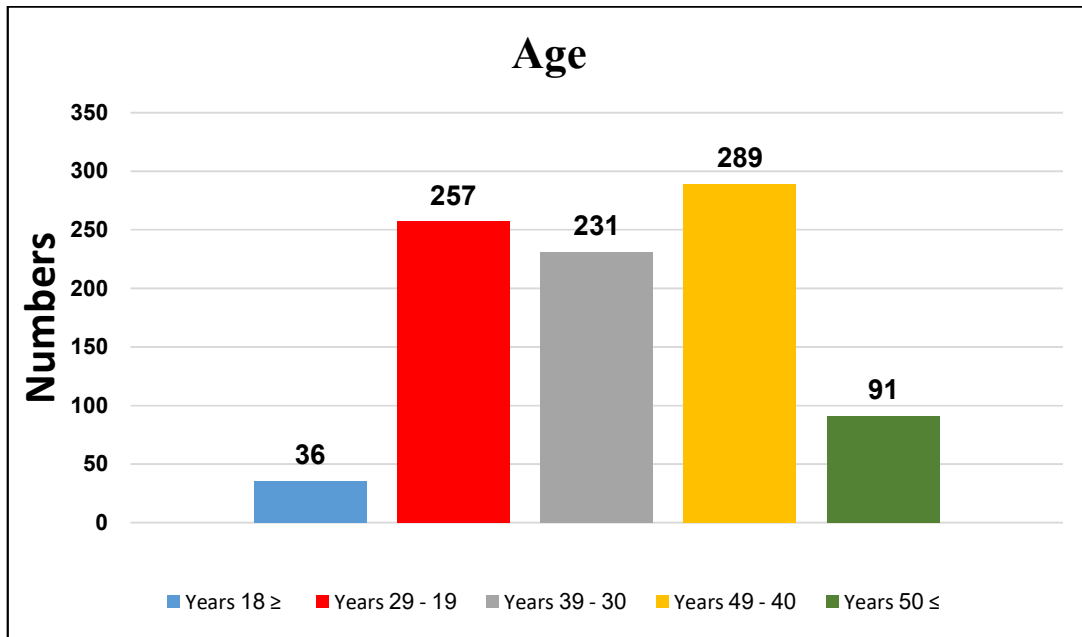


Figure 1: Distribution of age group among participants from Eastern Region  
Most participants were from three age groups (19-29, 30-39, and 40-49 years) as they account for 85.9% of total participants. On the other hand, age group ( $\geq 50$  years) and age group ( $\leq 18$  years) were the lowest participants groups as they account for 10% and 3.9%, respectively. Based on the gender of participants (Figure 2), female participants were the dominant participants as they were account for more than half of participants (57.4%),

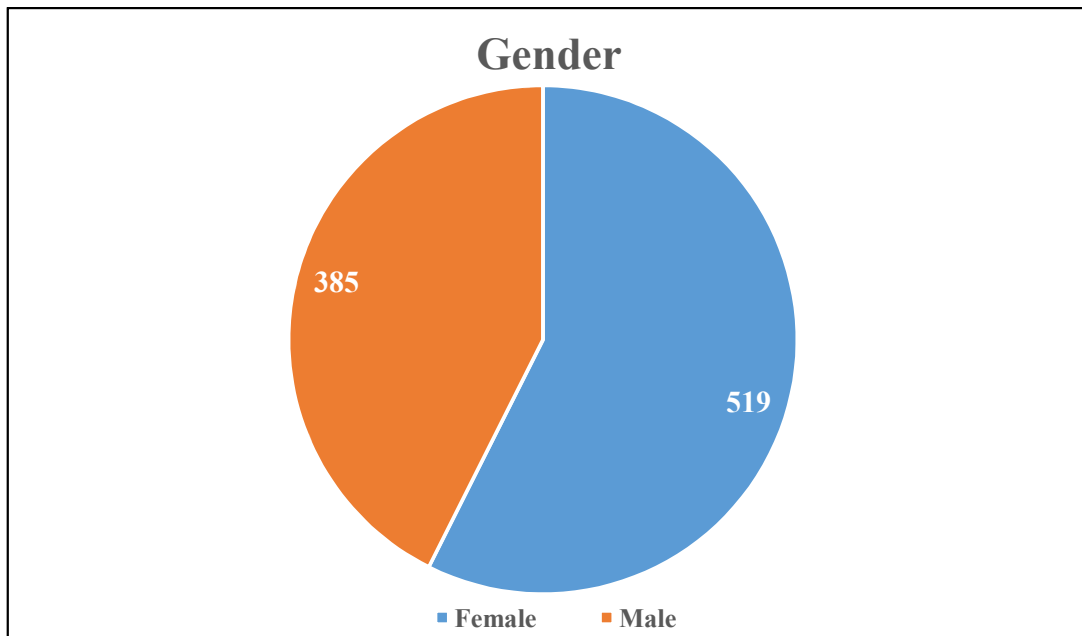


Figure 2: Distribution of gender among participants from Eastern Region

Figure 3 is demonstrating the distribution of education levels among the participants of this study. Almost three fifths of participants (58.2%) had bachelor's degree, and 27% of participants had high school. Higher education such as master's and PhD degree were the lowest groups as they account for 1.2% and 0.4%, respectively.

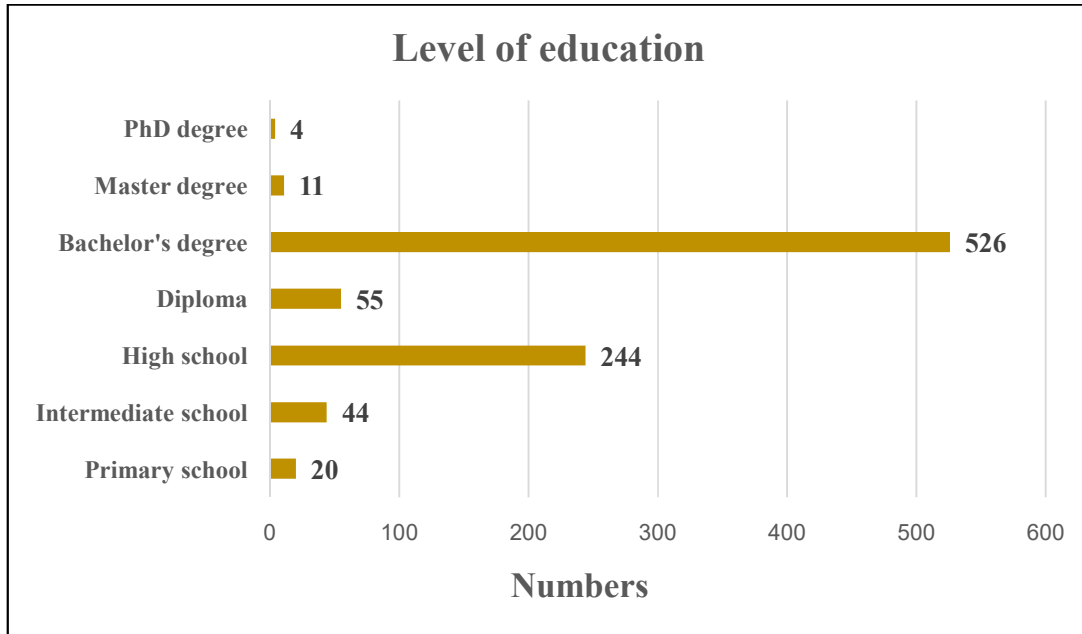


Figure 3: Distribution of education level among participants from Eastern Region  
Almost three quarters of participants (73.7%) were married, while almost one third of participants were single (26.3%) as it was demonstrated in Figure 4.

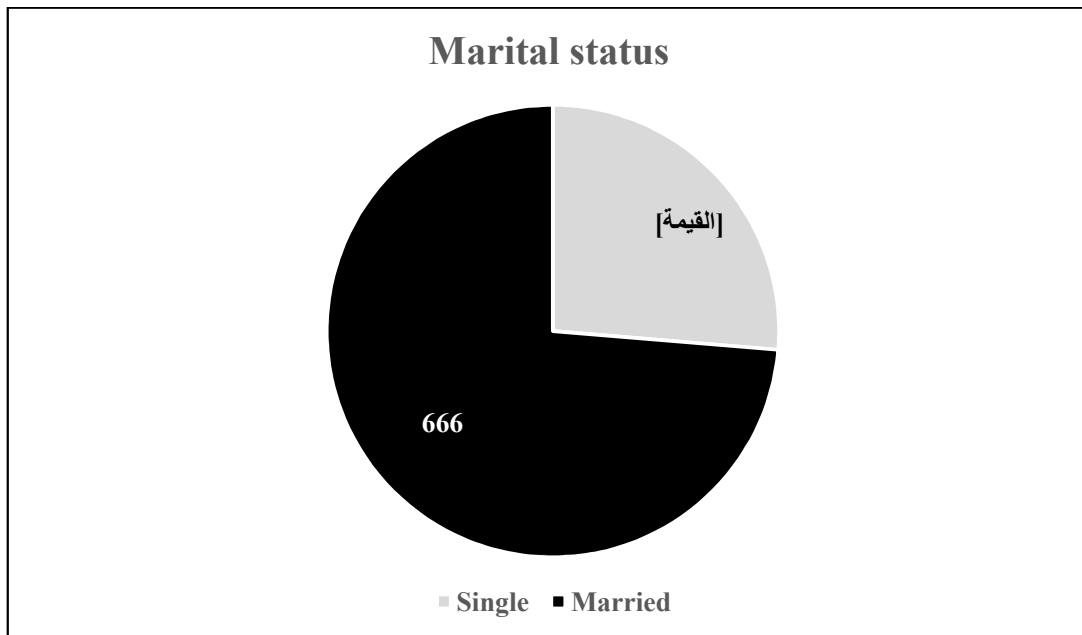


Figure 4: Distribution of marital status among participants from Eastern Region

The participants were asked about whether they are smokers or no, and most of participants (85.7%) were not smokers as demonstrated in Figure 5.

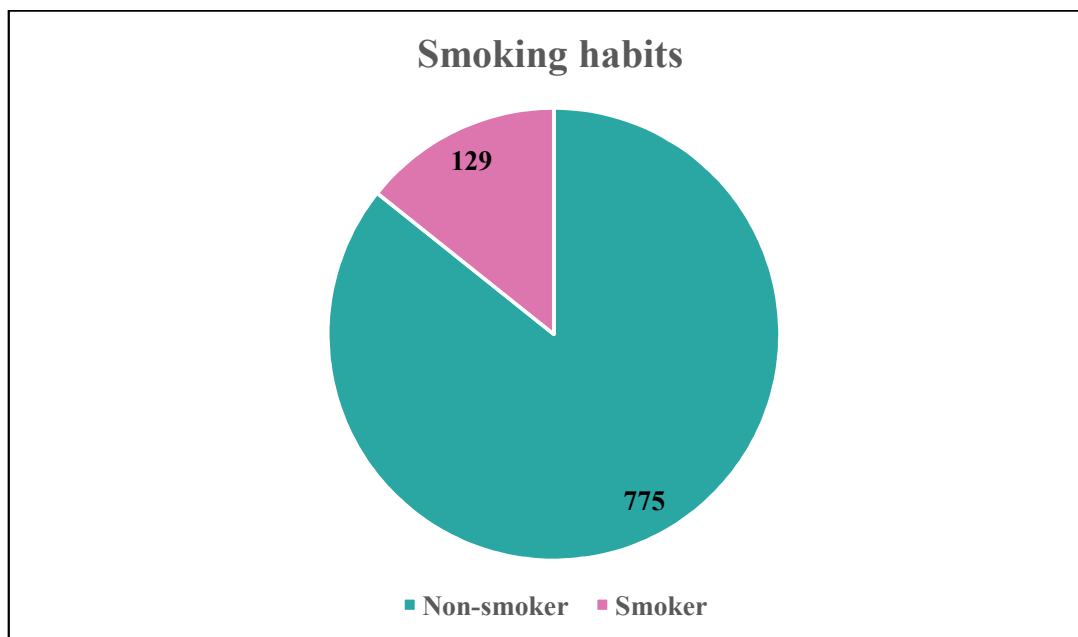


Figure 5: Distribution of smoking habits among participants from Eastern Region

**Information about the participants history:**

The participants were asked eight questions about their history of CD as summarized in Table 1. One of these questions is about if they have a relative that was diagnosed with CD. Most participants (86.6%) did not have a relative that was diagnosed with it (Table 1). Also, almost all participants (95.1%) have not had appendectomy. Only one third of participants (34.5%) has used birth control pills. Moreover, 861 of participants stated that they do not frequently use antibiotics for chronic condition. More than three fifths of participants (61.3%) use low fat diet, while about quarter of participants use either high fat diet or high fibre diet. Regarding participants income, 84.9% of participants have average income. It was not surprising that 84.3% of participants have no symptoms as only thirteen participants (1.4%) have CD. Abdominal pain was the most common prolonged symptom as it was accounted for 11.3%.

Table 1: Participants’ information about their history:

Question	Answer	n (%)
<b>Do you have relative that have been diagnosed with Crohn’s disease?</b>	Yes	42 (4.6)
	No	783 (86.6)
	Maybe	79 (8.7)
<b>Have you had an appendectomy?</b>	Yes	44 (4.9)
	No	860 (95.1)
<b>Have you used birth control pills (for females)?</b>	Yes	179 (34.5)
	No	332 (64)
	No answer	8 (1.5)
<b>Are you frequently using antibiotics because of a chronic condition?</b>	Yes	43 (4.8)
	No	861 (95.2)
<b>What kind of diet do you have?</b>	A high-fat diet	229 (25.3)
	A high-fibre diet	219 (24.2)
	A low-fat diet	554 (61.3)
	A low-fibre diet	148 (16.4)

<b>What is your level of income?</b>	Average	767 (84.9)
	High	57 (6.3)
	Low	80 (8.8)
<b>Have you been diagnosed with Crohn's disease?</b>	Yes	13 (1.4)
	No	891 (98.6)
<b>Do you have any of the following symptoms for prolonged and frequent periods?</b>	Abdominal pain	102 (11.3)
	Bloody stool	28 (3.1)
	Diarrhea	31 (3.4)
	No complain	762 (84.3)
	Weight loss	9 (1)

**Participants knowledge about the relationship between CD and smoking:**

The participants were asked four questions about their knowledge about the relationship between Crohn's disease and smoking and were divided regarding their age, gender, level of education, and smoking habitat in Table 2 – 5. As demonstrated in Table 2, the statistical analysis showed there is a significant difference ( $p<0.05$ ) between the age of participants and their knowledge of Crohn's disease and smoking in question 1, 2, and 4. Also, there is a significant difference ( $p<0.05$ ) between the gender and smoking habit of participants and their knowledge of CD as demonstrated in Table 3 and Table 5 in all questions. According to Table 4, the level of education of participants only showed a significant difference ( $p<0.05$ ) in question 1.

Table 2: Distribution of participants different responses according to their age group:

Variation	Responses among participants age group n (%)						p value
	Overall (n=904)	≤ 18 Years (n=36)	19-29 Years (n=257)	30-39 Years (n=231)	40-49 Years (n=289)	≥ 50 Years (n=91)	
Is there a link between smoking and Crohn's disease?							
Yes	466 (51.5)	21 (58.3)	166 (64.6)	94 (40.7)	137 (47.4)	48 (52.7)	0.00
No	438 (48.5)	15 (41.7)	91 (35.4)	137 (59.3)	152 (52.6)	43 (47.3)	
Do you think that smoking increases the severity of Crohn's disease?							
Yes	564 (62.4)	29 (80.6)	178 (69.3)	137 (59.3)	162 (56.1)	58 (63.7)	0.003
No	340 (37.6)	7 (19.4)	79 (30.7)	94 (40.7)	127 (43.9)	33 (36.3)	
Do you think smokers are at a greater risk of developing Crohn's disease than non-smokers?							
Yes	607 (67.1)	28 (77.8)	178 (69.3)	144 (62.3)	189 (65.4)	68 (74.7)	0.109
No	297 (32.9)	8 (22.2)	79 (30.7)	87 (37.7)	100 (34.6)	23 (25.3)	
Do you think that smokers with Crohn's disease are more likely to have relapses and have more severe symptoms than non-smokers?							
Yes	689 (76.2)	31 (86.1)	205 (79.8)	160 (69.3)	220 (76.1)	73 (80.2)	0.030
No	215 (23.8)	5 (13.9)	52 (20.2)	71 (30.7)	69 (23.9)	18 (19.8)	

Table 3: Distribution of participants different responses according to their gender:

Variation	Responses among participants gender group n (%)			<i>p</i> value
	Overall (n=904)	Female (n=519)	Male (n=385)	
Is there a link between smoking and Crohn's disease?				0.00
Yes	466 (51.5)	310 (59.7)	156 (40.5)	
No	438 (48.5)	209 (40.3)	229 (59.5)	
Do you think that smoking increases the severity of Crohn's disease?				0.00
Yes	564 (62.4)	366 (70.5)	198 (51.4)	
No	340 (37.6)	153 (29.5)	187 (48.6)	
Do you think smokers are at a greater risk of developing Crohn's disease than non-smokers?				0.00
Yes	607 (67.1)	386 (74.4)	221 (57.4)	
No	297 (32.9)	133 (25.6)	164 (42.6)	
Do you think that smokers with Crohn's disease are more likely to have relapses and have more severe symptoms than non-smokers?				0.00
Yes	689 (76.2)	427 (82.3)	262 (68.1)	
No	215 (23.8)	92 (17.7)	123 (31.9)	

Table 4: Distribution of participants different responses according to their education level:

Variation	Responses among participants education level group n (%)								p value
	Overall (n=904)	Primary school (n=20)	Intermediate school (n=44)	High school (n=244)	Diploma (n=55)	Bachelor's degree (n=526)	Master's degree (n=11)	PhD degree (n=4)	
Is there a link between smoking and Crohn's disease?									
Yes	466 (51.5)	8 (40)	13 (29.5)	123 (50.4)	24 (43.6)	289 (54.9)	6 (54.5)	3 (75)	0.025
No	438 (48.5)	12 (60)	31 (70.5)	121 (49.6)	31 (56.4)	237 (45.1)	5 (45.5)	1 (25)	
Do you think that smoking increases the severity of Crohn's disease?									
Yes	564 (62.4)	9 (45)	23 (52.3)	150 (61.5)	32 (58.2)	340 (64.6)	7 (63.6)	3 (75)	0.379
No	340 (37.6)	11 (55)	21 (47.7)	94 (38.5)	23 (41.8)	86 (35.4)	4 (36.4)	1 (25)	
Do you think smokers are at a greater risk of developing Crohn's disease than non-smokers?									
Yes	607 (67.1)	11 (55)	29 (65.9)	166 (68)	27 (49.1)	365 (69.4)	6 (54.5)	3 (75)	0.069
No	297 (32.9)	9 (45)	15 (34.1)	78 (32)	28 (50.9)	161 (30.6)	5 (45.5)	1 (25)	
Do you think that smokers with Crohn's disease are more likely to have relapses and have more severe symptoms than non-smokers?									
Yes	689 (76.2)	13 (65)	27 (61.4)	185 (75.8)	43 (78.2)	410 (77.9)	7 (63.6)	4 (100)	0.126
No	215 (23.8)	7 (35)	17 (38.6)	59 (24.2)	12 (21.8)	116 (22.1)	4 (36.4)	0 (0)	

Table 5: Distribution of participants' different responses according to their smoking habitat:

Variation	Responses among participants smoking habitat n (%)			<i>p</i> value
	Overall (n=904)	Non-smoker (n=775)	Smoker (n=129)	
Is there a link between smoking and Crohn's disease?				0.00
Yes	466 (51.5)	440 (56.8)	26 (20.2)	
No	438 (48.5)	335 (43.2)	103 (79.8)	
Do you think that smoking increases the severity of Crohn's disease?				0.000
Yes	564 (62.4)	524 (67.6)	40 (31)	
No	340 (37.6)	251 (32.4)	89 (69)	
Do you think smokers are at a greater risk of developing Crohn's disease than non-smokers?				0.000
Yes	607 (67.1)	559 (72.1)	48 (37.2)	
No	297 (32.9)	216 (27.9)	81(62.8)	
Do you think that smokers with Crohn's disease are more likely to have relapses and have more severe symptoms than non-smokers?				0.000
Yes	689 (76.2)	627 (80.9)	62 (48.1)	
No	215 (23.8)	148 (19.1)	67 (51.9)	

**Discussion:**

The aim of the present research was to evaluate people awareness of the relationship between smoking and CD in Eastern Region of Saudi Arabia with a sample size of 904 participants. This study has shown that, almost half of participants (51.5%) think that there is a relationship between smoking and CD, while majority of participants (62.4%) are aware that smoking increases the severity of CD. Also, most participants are aware that smokers have higher risk of developing CD and that smokers have higher chance of developing severe symptoms than non-smokers with participant percentage of 67.1% and 76.2%, respectively.

The most obvious finding to emerge from this study is that different age groups of participants resulted in significant different in three questions. Three age groups (less than 18, 19-29, and more than 50 years) are the highest groups that identify the correct answers compared to other groups as shown in Table 2. Female participants demonstrated to have higher correct answers compared to male participants with significant different in all four questions (Table 3). This might justify the highest correct answers among non-smokers where they have significant different in all four questions (Table 5) especially as 92.2% of smokers are male (data are not included). On the other hand, level of education did not seem to matter that much as there was only one significant different. Participants with PhD demonstrated the highest correct answers among other participants (Table 4). Many studies have demonstrated the link between smoking and CD, and for that reason smoking cessation program is needed as it improves the disease prognosis (11).

As Table 5 showed that smokers have less awareness of relationship between smoking and CD as more than half of the smokers did not select the correct answers (only 20.2% selected the correct answer for question number 1). This result is supported by another study which showed that CD patients are unaware of the risk of smoking on their condition (12). In contrast, another study was conducted on CD patients and found that current smokers (79.5%) have more awareness than non-smokers (43%) about the link between smoking and CD (13). Also, another study showed that CD patients are more aware about the risk of smoking on CD than control group (14). There is only 1.4% of CD patients in our study which might justify their lack of awareness. However, more education tools should be applied especially to smokers with CD and smoking cessation program should be promoted.

### **Conclusion:**

Data showed that general non-smoker people are aware of the relationship between smoking and CD. On the other hand, most smokers are unaware of the relation between their habit and the disease. Therefore, education should be provided to smokers with emphasis how smoking increase the risk of developing the disease and how it negatively impacts its course.

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### **Appendix:**

#### **Biographical data :**

- What is your gender ? 1- male 2- female
- How old are you ?
- What is your educational level ?
  - 1- Illiterate
  - 2- Elementary school
  - 3- Intermediate school
  - 4- High school
  - 5- Bachelor degree
  - 6- Others

If others please specify :

- What is your marital status :
  - 1- Single
  - 2- Married
- Where do you live ?
  - 1- Al-Hassa
  - 2- Somewhere else

If somewhere else please specify :

#### **Risk factors for crohn's disease**

- Are you smoker :
  - 1- YES
  - 2- NO
- Are you taking oral contraceptive pills (for females) :
  - 1- Yes
  - 2- No
- Have you had appendix removal?
  - 1- Yes
  - 2- No
- Has any one of your family have been diagnosed with crohn's diseases?

- 1- Yes
- 2- No

- Are you taking antibiotics chronically for a medical illness ?
  - 1- Yes
  - 2- No

If yes, please specify:

- Mark the diet that you are following:
  - Low fat
  - High fat
  - High fiber
  - Low fiber
  
- How do you classify Your socioeconomic status:
  - 1- Low
  - 2- Average
  - 3- High

#### **About crohn's disease**

- Have you been diagnosed with crhon'sdisease ?
  - 1- Yes
  - 2- No
- Do you have chronic episodes of the following syptoms :
  - Abdominal pain
  - Diarrhea
  - Bloody stool
  - Weight loss
- Is there any relation between smoking and crohn'sdisease ?
  - 1- Yes
  - 2- no
- Do you think smoking makes crohn's disease worse?
  - 1- Yes
  - 2- No
- Are smokers more liable to develop crohn's disease than non-smokers?
  - 1- Yes
  - 2- No
- Are Smoker more likely to have relapses and more severe form of the disease?
  - 1- Yes
  - 2- no



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