



Colonic Polyps: Prevalence, Risk Factors and Classification in a Sample of Lebanese Population Who Underwent Colonoscopy

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Abstract

Background and objectives: Colorectal cancer is one of the most common cancers worldwide. It is the third leading cause of cancer-related death. There are multiple risk factors that contribute to its development. CRC or colorectal polyps may be detected by several methods, but colonoscopy remains the mainstay method. The clinical presentation may vary between patients. Screening is recommended for all patients above 45 years of age. Our objective was to identify the prevalence of colorectal polyps in the Lebanese population and the major contributing risk factors for its development.

Methods: This is a monocentric prospective cohort study that included 470 patients that underwent colonoscopy for multiple reasons. Information concerning multiple variables (age, gender, smoking, diabetes mellitus, BMI, preparation and indication for colonoscopy, pathology of polyps found) was collected using a standardized questionnaire. Statistical analysis was done using the software SPSS.

Results: The studied population's age varied between 15 and 93. The data analysis showed that a positive colonoscopy result defined by the presence of a polyp was significantly associated with smoking (75,52%), obesity or overweight (64,06%), male sex (65,63%), a family history of colon cancer (23,43%) and a mean age of $77,34 \pm 18$ years. The main indication for colonoscopy was anemia (37.75%), and the main detected pathology was adenoma with dysplasia (20.21%).

Conclusion: BMI, smoking, diabetes, age 50 and above were risk factors statistically related to colonic polyps. The screening was not considered a main issue for presentation so awareness should be raised in our population targeting early detection of colon cancer when it is highly curable.

Keywords: Colonic Polyps; Colonoscopy; Colorectal Cancer; Colorectal Polyps; Risk Factors

Abbreviations

BMI: Body Mass Index; CA: Cancer; CRC: Colorectal Cancer; FAP: Familial Adenomatous Polyposis; FIT: Fecal Immunochemical Test; FOBT: Fecal Occult Blood Test; GI: Gastrointestinal; HNPCC: Hereditary Nonpolyposis Colon Cancer; IBD: Inflammatory Bowel Disease; IRB: Institutional Review Board; KRAS: Kirsten Rat Sarcoma Viral Oncogene Homolog; MSI: Microsatellite Instability; NCR: National Cancer Registry; WHO: World Health Organization.

Introduction

Colorectal cancer (CRC) is considered one of the major global health care issues since it accounts for about 10% of new cancer cases [1], and globally CRC found to be the second most common cancer among females after breast cancer and the third among males ranking after lung and prostate cancers [2]. It is also one of the leading causes of cancer-related mortality ranking fourth after lung, liver and stomach cancers. The World Health Organization WHO estimates an increase of 77% in the number of newly diagnosed cases of CRC and an increase in 80% in deaths from CRC by 2030 [3]. In a study done regarding the Incidence of Colorectal Cancer in the Middle East, Jordan had the second place for the incidence of CRC after Israel and the next countries in this region were Syria, Turkey and Lebanon [1].

In Lebanon, CRC is ranked as the fourth most prevalent type of cancer among males after lung, prostate and bladder ca and the second among females after breast cancer [2] and a study done by the WHO showed an 8% mortality rate in males and females among other cancer related deaths [4].

It is known that most CRC arise from adenomas and progression to cancer from an early adenoma takes 5-10 years due to gradual accumulation of genetic and epigenetic factors [3]. So, colonoscopy is found to be the best modality in screening and preventing CRC [5] because detecting an adenoma during a preventive colonoscopy could prevent its progression to CRC and thus decreases mortality and morbidity associated to it.

Studies show that early sigmoidoscopy screening reduces mortality from cancer of rectum and distal colon [6]. Another study concerning colonoscopic polypectomy resulted in a lower-than-expected incidence of CRC, which supports the view that colorectal adenomas progress to adenocarcinomas [7]. These studies prove that screening is important in preventing CRC morbidity and mortality.

A study that assessed the understanding of CRC among Lebanese population showed that more than 59% of respondents never heard about CRC, and among those who are familiar with CRC, 57% are not familiar with its screening methods [2]. WHO claims that bowel cancer screening by exam or colonoscopy is not generally available at the public primary health care level [4]; even though healthcare services for prevention and early detection of CRC are present but their availability and accessibility for the general public are very low [2] and that can be related to the lack of awareness campaign available in the field of CRC?

Thus, the aim of our study is to identify the prevalence and the risk factors associated to colorectal cancer in the Lebanese population.

Epidemiology

One of the most common cancers worldwide is colorectal cancer (CRC). It is the third common cancer, and fourth common cause of cancer-related death after lung, liver and stomach ca, recording about 700,000 deaths per year [8]. Before the improvements in health care systems and the era of screening, CRC was more commonly detected in Western countries mainly European regions, New Zealand, Australia and Northern America and has been known as an indicator of socioeconomic development [8]. Even though Middle East countries were considered of low risk region for the development of CRC, recent studies showed that the incidence is increasing due to several factors such as the influence of the Western lifestyle on the Arab population [1,9]. The highest incidence of CRC in Arab countries reported is Jordan followed by Syria and Lebanon [1]. The prevalence of CRC was 0.72% in Saudi Arabia and 0.78% in the United Arab Emirate, while in Egypt, it ranged from 0.4% to 14%. In Lebanon, and according to the WHO classification in 2014, CRC is one of the most prevalent cancer in both sexes, accounting for 8.6% and 8.9% of cancer-related death respectively in females and males [4], and has a poor prognosis, with high mortality rate because the patients are presenting late with advanced disease stages [10].

Risk factors

Age, gender, and lifestyle

The risk of developing colorectal cancer worldwide accounts for 3-4%. Hereditary and genetics are major risk factors but also personal parameters such as age, gender and history of IBD and

western lifestyle such as smoking, alcohol consumption, obesity, diet rich in processed red meat and lack of physical activity play major factors in developing polyps thus leading to CRC [8]. Apart from inherited cancer, developing CRC prior the age of fifty is rare while its incidence increases post the fifth decade [11]. The mean age in the US was 71 and 61 in the Middle east [1]. In Lebanon the mean age of patients diagnosed with CRC during 2015 was 61.5 years among men and 62.9 years among women [10]. Development of CRC in early ages presents with much more aggressive disease than those diagnosed by the age of 70 and above [12]. In Lebanon 77.4% of the population with CRC where above 50 (7959 cases from a total of 10284 incident cases of CRC) reaching its maximum by age 75 according to the NCR data in 2016 [11].

A study done by Allen White., *et al.* (2018) showed that colorectal cancer is highly influenced by gender and sex and the overall incidence and mortality rates are higher in males, but unfortunately there is no straightforward evidence that reveals the role of gender in colorectal cancer [13]. Differences also exist at the level of diagnosis where women usually present more in emergency situations than men, also the anatomical site of the mass differs where females are more likely to present with right-sided colon ca; ascending colon and caecum whereas males have more left sided colon CA [12].

Lebanon, like other countries, had experienced many changes at the social, economic and demographic levels leading to lifestyle modifications. A low adherence to a balanced Mediterranean diet and a diet rich in carbohydrates, saturated fatty acids and energy and poor in fibers, calcium, vitamin A, C, D, selenium, folic acid and omega will increase the risk of CRC by 70% due to the secretion of proinflammatory cytokines and modulation of metabolic enzymes [8]. Increased relative risk factors of advanced colorectal cancer in those who consume enormous amounts of red meat compared to those who do not was shown in a study done by Amersi., *et al.* [12]. This might be due to the release of heterocyclic amines and polycyclic hydrocarbons after digestion, both of which are potential carcinogens [8]. Moreover, calcium can inhibit colonic epithelial hyperproliferation and thus inhibiting carcinogenesis [12]. Other factors such as obesity and mild to moderate physical activity leads to higher risk of CRC development due to the decrease in metabolic rate and minimal oxygen intake [14]. Actually, a good level of physical activity can have a 15% average protection rate

on CRC [11]. Diabetes is also a contributor since insulin like growth hormone plays a leading role in the body metabolism and the proper cell development [14]. As for tobacco usage, it increases the development of CRC 21% and 12% in males and females respectively specially when started at a younger age [12]. Tobacco usage shows an increase in the formation and growth of adenomatous polyps which are precancerous lesions [14] and so it's responsible of 12% of CRC mortality [15]. The relation of long-term smoking was still considered in CRC regardless they stopped or not since nicotine is also a carcinogen [8]. To note that passive smoking is considered also as an increasing risk for colorectal cancer development [11]. Thus, adherence to healthy lifestyle, and a strict control of modifiable risk factors such as the physical activity, body mass index, alcohol consumption can reduce the risk the CRC and attenuate the genetic risk [16].

Family history, IBD, and genetic factors

Colorectal cancer is either sporadic, familial, or inherited [5]. A previous history with either ulcerative colitis or Crohn's disease increases the chance of developing colorectal cancer by 2.5% and 3.7% respectively. This is due to the long-term inflammatory process in the GI system which leads to formation of dysplastic cells [8]. These patients must be followed by frequent colonoscopy since the higher risk of CRC starts 8 years after the disease onset [17]. Regardless of the relation between IBD and the development of CRC, no genetic predisposition is yet found to confirm [12].

Hereditary relation is another risk factor for someone to encounter colorectal carcinoma. First degree relatives with history of colon ca or colonic polyps increases the risk up to 25% [12]. The hereditary risk increases when a first-degree family member is diagnosed with colon cancer or polyps before the age of sixty or more first-degree relatives have been diagnosed with colon cancer or colon polyps at any age [18]. In fact, a meta-analysis showed that one affected relative with CRC can increase the risk for a 50-year-old patient from 1.8% (population lifetime risk) to 3.4% and 6.9% with two or more family members with CRC [19]. The main hereditary patterns for CRC are mainly familial adenomatous polyposis (FAP) and hereditary nonpolyposis colorectal carcinoma (HNPCC). 1-2% of colorectal ca patients present from predisposing FAP [18] whereas 2-3% of colorectal cancer patient present from predisposing HNPCC [20]. FAP associated to APC gene mutation, usually diagnosed by the age of fifteen is characterized by hundreds

to thousands of polyps through the intestine and usually patients will undergo a preventive colectomy before the age of 40 due to the high risk of cancer transformation [18]. Whereas Lynch syndrome or HNPCC is caused by mutations in the DNA mismatch repair system and its characterized by an early onset of colorectal tumor associated to other extra-colonic tumors such as endometrial, renal, urethral and others [20].

Colonic polyps

Colonic polyps are classified into benign or malignant [8]. Despite the variable types of polyps, the main documented CRC arise from adenomatous ones [5]. The benign colonic polyps are hamartomas, inflammatory, juvenile, and hyperplastic [5,21]. The adenomatous types have the highest potential to turn into malignancies and CRC [5]. Whereas hyperplastic polyps which arise mainly in the distal colon have low malignant potentials [21].

Colonic polyps are classified into three types histologically: tubular, tubulo-villous, and villous [21]. Tubular adenoma is the most common type reaching 85% of adenomatous polyps and is almost 90-95% benign [12]. They are the most common polyps excised with microscopic features of pedunculated shape and minimal degree of atypia [6]. Villous adenomas present 5% of adenomas and are more commonly sessile with higher degree of atypia [6,12]. Forty percent and above of villous polyps are malignant [12]. As for tubulo-villous type, the percentage of harboring malignancy varies according to the cell type prominent and degree of atypia [6]. They represent 10% of adenomas with 20% chance of malignant transformation [12].

The diagnosis of a malignant polyp depends on the size, histology, and degree of atypia present. The larger the size the higher the risk, reaching more than 40% probability in polyps measuring larger than 2 cm. Studies suggest that the transformation of a polyp from benign to malignant takes almost 10 years [12].

Signs and symptoms

It's well-known that precancerous lesions or polyps same as the early disease stages are usually asymptomatic, and thus they are mainly diagnosed by screening. Whereas many signs and symptoms can lead to CRC suspicion [22]. It depends according to the location of the tumor, the size and the presence of metastasis. Right sided colon cancer or proximal lesions mainly present with

anemia manifestations such as fatigue, pallor, malaise, palpitations and dyspnea upon exertion [23]. whereas left sided lesions can cause changes in bowel habits and fresh blood in stool [24]. In fact, left sided colon lumen is narrower with more well-formed stools leading to complete or partial occlusion that manifests by abdominal pain, distension, constipation, nausea and vomiting [25]. Sometimes patient can have diarrhea as stool moves beyond the occlusion area [22]. Metastatic and advanced disease may present with cachexia, temporal and intercostal muscle wasting, unintended weight loss, hepatomegaly due to hepatic metastasis and a general poor health. Rare presentations are also encountered in clinical practice such as generalized peritonitis due to colonic wall perforation, localized peritoneal signs caused by an abscess or walled-off inflammatory mass or colonic fistulas to adjacent organs such as small bowel or bladder [22].

Prevention and diagnosis of CRC

The diagnosis of CRC by clinical presentation is not common. This is due to the absence of specific and pathognomonic symptoms in the early disease, actually the lesion can stay asymptomatic until reaching multiple centimeters [3]. Patients may present with rectorrhagia, hematochezia or with symptoms of malignancy including weight loss, decrease appetite and even bowel obstruction [3]. The most beneficial ways to decrease morbidity and mortality associated with CRC is secondary prevention by screening [26]. Studies showed that the early detection of Colorectal Ca increases survival rates up to 75% [12]. Fecal occult blood test (FOBT), flexible sigmoidoscopy, fecal immunochemical test, stool DNA, and computed tomography scan are the mainstay of screening [14]. In addition, CT scan has good diagnostic parameters to detect pre-colectomy location and to stage colonic tumors [27]. All people aged fifty and above with average risk for colon ca should be screened as by the U.S preventive Services Task Force [12].

Fecal occult blood test (FOBT) and fecal immunochemical test (FIT) are the most important and well used methods. These methods are non-invasive, average pricing, and can be used in home settings [14]. Despite its poor detection of polyps, an FOBT positive test correlates to a medium size polyp proximal to the rectum or to carcinoma [26]. In Europe FOBT is used as the primary test of diagnosis [3]. FIT compared to FOBT is newer and cheaper [5].

The gold standard method for diagnosis is colonoscopy and it can help to decrease 88% of mortality [14]. The total miss rate of any polyp size is 22% with highest percentage reaching 26% of polyps less than 5 mm [9]. Colonoscopy is recommended every 10 years to those above 45 specially with positive FOBT as by the U.S preventive task forces [12]. It is recommended due to its 80% and 90% sensitivity and specificity to precancerous and cancerous lesions and polyps [26]. Despite its importance, colonoscopy is invasive and thus has many complications such as post-polypectomy bleeding and perforation [3].

Other methods such as biomarkers and computer tomography are also used in prevention and diagnosis of colorectal cancer. CT colonography might be used when a patient refuses colonoscopy or has considerable risk for sedation related complications. This modality needs air prepared bowel and helps to diagnose polyps larger than 5mm but still has pitfalls and less sensitivity than colonoscopy [26]. In addition to FOBT the most used biomarkers are KRAS and MSI mutations. They help in prognosis and treatment selection [8]. Multiple alternatives are present heading to decrease CRC burden starting before the appearance of symptoms by education campaign, then the primary prevention that consists in controlling modifiable risk factors such as cigarette smoking, obesity, alcohol consumption and unhealthy diet, and adherence to protective factors like physical activity or aspirin intake. While secondary prevention consists in revealing and screening precancerous lesions using the different methods listed above [28]. And the treatment must be individualized according to the histology, family history and prognostic biomarkers aiming to increase patient's cure.

Location and histological types

A study done in 2011 by Sallahu, *et al.* showed that the rectum is the most common site of involvement [29]. Histologically, adenocarcinomas are the predominant lesion histiotype. Although melanoma, lymphoma, leiomyosarcoma and hemangioma can be rarely found [30,31].

Staging

Colorectal cancer can be localized and so-called carcinoma in situ, or high-grade dysplasia and its confined to the mucosa without invasion to the muscularis mucosa. However, when the muscularis mucosa is invaded, hematogenous and lymphatic metastasis are often found [22]. Recently this cancer is staged according to the

TNM scale; where T stands for mural depth of the primary tumor, N local lymph node metastasis and M for the presence of distant metastasis [30] (Table 1).

TNM classification.

Primary tumour (T)

TX: Primary tumour cannot be assessed

T0: No evidence of primary tumour

Tis: Carcinoma in situ: intraepithelial or invasion of the lamina propria

T1: Tumour invades submucosa

T2: Tumour invades muscularis propria

T3: Tumour invades through the muscularis propria into the subserosa, or into the nonperitonealized pericolic or perirectal tissues

T4: Tumour directly invades other organs or structures and/or perforates the visceral peritoneum

Regional lymph nodes (N)

NX: Regional nodes cannot be assessed

N0: No regional lymph node metastasis

N1: Metastasis in 1 to 3 regional lymph nodes

N2: Metastasis in 4 or more regional lymph nodes

Distant metastasis (M)

MX: Presence of distant metastasis cannot be assessed

M0: No distant metastasis

M1: Distant metastasis

Table 1: TNM classification of colorectal cancer [30].

Treatment of CRC

Once an adenomatous polyp is detected the definitive treatment is mass removal. The debates still vary upon the size of the polyp but all polyps larger than 5mm are better to be resected immediately. Polyps less than 5mm which are detected by non-invasive techniques may be delayed for re-assessment for their negligible risk of malignant potentials [26]. As for rectal cancer of stage 2 and 3, the choice of chemotherapy is added to treatment. This is because of the substantial risk of invasion and the potential of reaching pelvic organs [3]. Chemotherapy allows the shrinkage of the mass before excision. Surgical removal is for large tumors with lymph node excision. Surgical type and choice vary according to the size and type of polyp. Polyps are removed through colonoscopy. Sessile polyps may not be completely excised through polypectomy thus might need partial colectomy. Other types of polyps that might need colectomy are pedunculated ones with invasive carcinoma extending to the stalk [3,26]. Despite that the vast majority of patients present late with progressive and invasive disease, surgical resection is still the principal curative treatment. To note that immunotherapy can also be used as adjuvant or neoadjuvant

treatment such as cetuximab which is a monoclonal antibody that inhibits the epidermal growth factor receptor [32].

Prognosis

Studies showed the existence of significant correlation between patient’s symptoms, lesion’s location and overall patients’ survival [33]. Survival also depends on the stage at diagnosis and the response to treatment [32]. Left sided colon tumor presenting with visible blood in stool, has less vessel invasion, lower TNM staging

and higher survival, as compared with right sided colon cancer mainly presented by abdominal pain and anemia [33,34].

Net survival rates up to 5 years were shown in blue for right-sided colon cancer and in red for left-sided colon cancer.

As seen in table 2 below, many studies were conducted worldwide to establish the major risk factors associated with colorectal cancer, its prevalence and burden.

Study	Population	Country	Colon ca associated risk factors and prevalence
A Review of the Incidence of Colorectal Cancer in the Middle East [1]	Middle east population	Middle east	Countries located on the coast of the Mediterranean Sea have the highest rate of CRC.
Risk Factors for the Diagnosis of Colorectal Cancer [35]	800 participants	Poland	Obesity, low physical activity, smoking and red meat consumption.
Obesity and colorectal cancer risk: A meta-analysis of cohort studies [36]	Cohort study up to January 1, 2007		Obesity is a significant risk factor for colorectal cancer. This relationship is more significant in men than in women.
Colorectal cancer risk factors [37]	Meta analyses		Increased risk of colorectal cancer is associated with inflammatory bowel disease, CRC in first degree relatives, higher BMI, cigarette smoking and low fruit and vegetable consumption.
Dyslipidemia and colorectal cancer risk [38]	1,987,753 individuals from 17 prospective studies		CRC is associated with high levels of serum triglyceride and total cholesterol, whereas HDL can decrease CRC risk.
Association of Body Mass Index With Risk of Early-Onset Colorectal Cancer [39]	Studies from PubMed, EMBASE, and Web of Science up to February 2021		Increasing BMI increase the risk of early onset colorectal cancers, with much higher risk for obesity than for overweight.
Colorectal cancer: epidemiology, risk factors, and health services [11]			The risk of developing colorectal cancer increase with age, personal history of inflammatory bowel disease, polyps and cancers.
A Review of Colorectal Cancer in Terms of Epidemiology, Risk Factors, Development, Symptoms and Diagnosis [40]	93 studies including over 85 000 cases, 100 000 controls, and 2 000 000 exposed	United States of America	Non- modifiable risk factors: -ethnicity: African American. - sex: male gender, and women are more prone to right sided colon cancer. -Age: above 65. -IBD, cystic fibrosis. Modifiable risk factors: -obesity and physical inactivity. - red and processed meat rich diet. -Smoking and alcohol intake. -long term use of NSAIDs can lower the risk of CRC. Healthy dietary patterns can decrease the risk of developing colon and breast cancer specially in post-menopausal women.
Possible role of diet in cancer [41]			

Geographic patterns of cancer in the population-based registry of Egypt [42]	Population-based cancer registry of Gharbiah	Egypt	Male sex is a risk factor for developing CRC: incidence of $6.5/10^5$ for men and $4.2/10^5$ for women for the period of 2000–2002.
Global colorectal cancer burden in 2020 [43]	Global population		China and the United States have the highest estimated number of CRC new cases in 2020.
Probing the Colorectal Cancer Incidence in Lebanon [44]	National Cancer Registry [NCR] of Lebanon from the years of 2005 till 2015 inclusive	Lebanon	The average of colorectal cancer was 12.6 per 100,00 for males and 10.7 per 100,00 for female.
Colorectal cancer screening knowledge and uptake in Lebanon: a national survey [45]	1200 participants of the Lebanese population aged 50 years and above	Lebanon	Colorectal cancer screening = Lebanon is limited and justify the need for public health interventions.
Colorectal Cancer in Lebanon: Incidence, Temporal Trends, and Comparison to Regional and Western Countries [11]		Lebanon	-Colorectal cancer in Lebanon is increasing among males and females. - Male gender and increased age are important risk factors. -High age-specific incidence rates at age groups 40-44 and 45-49 years.

Table 2: Multiple worldwide studies showing the different colon cancer risk factors and its prevalence.

In Lebanon studies showed an increasing rate of colorectal cancer but the data lacks detailed risk factors attributed to the CRC. Thus, our study conducted on a sample of the Lebanese population in the Middle east Institute of Health aims to identify the major risk factors associated to colorectal cancer in Lebanon, its prevalence, and major polyp's type found during colonoscopy.

Objectives and Methods

Primary objective was:

- To estimate the polyp detection rate by calculating the prevalence of colonic polyps in Lebanese people who underwent colonoscopy.

Secondary objectives were:

- To assess risk factors associated with polyp detection.
- To classify polyps according to their type.
- Percentage of symptomatic and asymptomatic screening

Ethical consideration

Anonymity

The data gathered from each participant was entered anonymously into an excel sheet. Personal information that was not valuable to the statistical analysis of the measured variable was dismissed including the participants name and any other form of identification.

Study design

This was a prospective and monocentric study that was conducted on a sample of Lebanese population in Middle East Institute of Health, Bsalm that undergoes colonoscopy.

Study population

Number of patients

A sample size of 470 individuals (with minimum sample size of 212 calculated by Cochran formula) in total from the Lebanese population who underwent colonoscopy.

Inclusion criteria

- Any patient above 15 year of age.
- ptomatic or asymptomatic patient.
- Exclusion Criteria
- Patient with previous or current colorectal cancer. Other malignancies are included in the study.
- Incomplete colonoscopy.

Methods and data collection

After having the purpose and methods of the study explained, information concerning multiple variables was collected directly from each of the enrolled participants using a standardized questionnaire. This questionnaire will assess the reason behind the colonoscopy, the presenting symptom(s), the associated comorbidity(s) and other risk factors.

Some data was collected from patient's files and included information about the demographics of the patients (age, gender, educational level), presence of comorbidities (diabetes, hypertension, dyslipidemia), baseline BMI, preparation to colonoscopy, pathology, aspirin use, smoking and others (see appendix 3). All participants chosen were confirmed to having met the inclusion criteria for the study and to not having any of the exclusion criteria. If any of the participants enrolled was found to have any of the exclusion criteria or was found to be missing any of the inclusion criteria, their name was omitted.

Methods used by our director: 470 participants at Bsalim hospital underwent colonoscopy after taking a bowel preparation one day before the procedure. The quality of the preparation was assessed during colonoscopy using Boston bowel preparation scale (figure 1) [26]. Polyps detected during colonoscopy with good bowel preparation were excised and biopsied.

Test is positive when polyp is detected, and all other findings will be considered negative.

All data were entered in an excel sheet that was later used for the statistical analysis.

Negative and positive samples will participate in calculating the prevalence of polyp among the screened population, in assessing risk factors and in stratifying polyp subtypes according to risk factors.

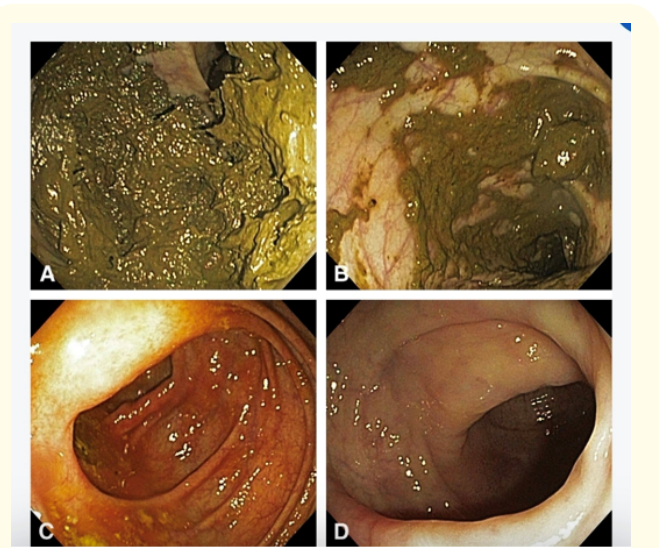


Figure 1: The BBPS: A, Segment score 0, unprepared colon segment with mucosa not seen because of solid stool that cannot be cleared. B, Segment score 1, portion of mucosa of the colon segment seen, but other areas of the colon segment not well seen because of staining, residual stool, and/or opaque liquid. C, Segment score 2, minor amount of residual staining, small fragments of stool and/or opaque liquid, but mucosa of colon segment seen well. D, Segment score 3, entire mucosa of colon segment seen well with no residual staining, small fragments of stool and/or opaque liquid [26].

Data analysis

Statistical analysis was done using the software SPSS version 25. Descriptive statistics were calculated and presented as frequencies, percentages, means, ranges, minimum and maximum values, mode, and standard deviation as applicable.

Analysis of variance (ANOVA) was used to study the effect of age and gender on BMI reduction. Paired sample t-test was used to assess the variation in BMI before the intervention and 6 months afterwards. Independent samples t-test was used to assess the correlation between comorbidities (diabetes, dyslipidemia and hypertension) and BMI reduction. A p value < 0.05 was considered significant in all applied tests.

Results

Demographics of the enrolled patients

The mean age of the 470 participants of this study was 54 ± 16 years where the population answered was between 15 and 93 years. The mean body mass index of the participants was 25.95 ± 19 kg/m². As for gender, males participating were 55.96 (n = 263) slightly higher than females who were 44.05% (n = 207). Concerning the smoking status of the participants, the percentage of non-smokers 56.6% (n = 263) was higher than smokers 43.3% (n = 204) (Table 3).

	N	Minimum	Maximum	Mean	Std. Deviation
Age	470	15	93	54	16.0
BMI	470	15.4	45.1	25.95	19
Gender	Frequency			Percentage	
	Fe- males	207		44.05%	
	Males	263		55.96%	
Smoker	Yes	204		43.3%	
	No	266		56.6 %	

Table 3: Descriptive statistics of the patients’ demographics enrolled in this study.

Concerning aspirin use, only 18.3% (n = 86) uses aspirin and 81.7% (n = 384) do not use aspirin. Participants who took split doses of preparation were 81.49% (n = 383) and those who did not were 18.5% (n = 87).

The highest indication for colonoscopy was anemia 37.75% followed by abdominal pain 36.6%, surveillance 15.95% and screening 11.7%.

Preparation and outcomes of colonoscopy

A polyp was found in 128 patients. The overall percentage of those with positive polyp was 25.53%.

Pathology found by colonoscopy

The highest pathology detected was adenoma with dysplasia (20.21%), followed by inflammatory or hyperplastic type (2.76%) and adenocarcinoma being the least detected (2.12%).

Patients who underwent colonoscopy were prepared whereas minority were not (95.1% and 4.9% respectively). 96.38% (n = 453) had cecal intubation and 3.62% (n = 17) did not. A polyp was found in 128 patients. The overall percentage of those with positive polyp was 25.53%. all statistics are significant with p-value <0.05 (Table 4).

Preparation percentage	Cecal intubation	Polyp	Percentage with positive polyp
Adequate 95.1% (n = 447)	Yes 96.38% (n = 453)	Yes (n = 128)	25.53%
Inadequate 4.9% (n = 23)	No 3.62% (n = 17)	No (n = 342)	

Figure 4: During colonoscopy.

Patients with positive polyp

The percentage of male patients with positive polyp 65.63% (n = 84) was higher than that of women patients 34.37% (n = 44). The mean age of those who had polyps and were older than 50 years was 77.34 ± 18 years and those younger than 50 years was 22.66

± 14 years. 75.52% (n = 59) were smokers and 23.43% (n = 30) had a family history of colon cancer with p-value <0.05 in relation with positive polyp. As for pathology the highest is adenoma with dysplasia 74.21% followed by hyperplastic polyp (10.15%) and the least was adenocarcinoma (7.81%) (Table 5).

Sex (%)	Age < or > 50 Y/O (Mean SD)	Smokers (%)	Under Aspirin (%)	Family History of Colon Cancer (%)	Pathology (%)
84 Male (65.63)	29 < 50Y/O (22.66 ± 14)	59 (75.52)	39 (30.47)	30 (23.43)	Adenoma with dysplasia (74.21) Adenocarcinoma (7.81) Hyperplastic or inflammatory (10.15)
44 Female (34.37)	99 > 50Y/O (77.34 ± 18)				

Table 5: Demographics of patients with positive polyp.

Nine percent of those with positive polyps were diabetic. 64.06% (n = 82) of those who have polyps were overweight or obese. All data are with significant statistical p-value <0.05.

Discussion

Colorectal carcinoma (CRC) is one of the most common causes of mortality worldwide, it occupies the fourth rank in cancer related death [8]. Lebanon is the third Arab country with high rates reaching 8.9% [1,11]. CRC is affected by multiple factors such as age, gender, lifestyle, and genetics. The means of diagnosis are variable from least invasive to laparoscopic surgery. Colonoscopy is the mainstay for screening, diagnosis, and treatment of most polyps and CRC. Other methods of treatment include chemotherapy and surgical resection.

Multiple risk factors play a key role in increasing the rate of developing colorectal cancer. The older the patient the higher the risk of developing colorectal cancer [12]. Our study has shown a statistically significant increase in the number of colorectal polyps, whether premalignant or not, in the older population compared to those screened at a young age, with the mean age 77.34 years ± 18. Compared to other studies, data are similar as the risk of CRC increases mainly after the fifth decade. Also, WHO stated that the average age of colon ca in the Lebanese population was 75-year-old [6]. Previous studies concerning colorectal cancer and polyps showed that males presented a higher percentage than females [1]. At the same time our study revealed same outcome. Smoking has been known to contribute to multiple diseases and cancers. In colorectal cancer, heavy smoking increases the risk up to 21% in males and 12% in females [12]. In our study, non-smokers were the majority of the population, but 75% of patients having polyps were smokers.

Diabetes and lifestyle also play major role in developing CRC. Diabetes pathophysiology and its relation to growth hormone

contributes to colorectal cancer [14]. 9% of our participants with positive polyp are diabetic, and 64% are overweight. Sedentary lifestyle and elevated BMI increase CRC by 70% [8].

Other risk factors include family history, history of IBD, and history of polyps. As previously seen 23.43% of patients having polyps had a known family history of colon cancer. This is statistically verified with p-value <0.05. According to research data, those with previous history IBD are more prone to develop CRC, with an increased risk between 7% and 14% and that can be attributed to the abnormal cell growth rate caused by chronic inflammation in IBD [8,12]. In addition, this risk was higher in Ulcerative Colitis that in Crohn disease, and in males more than in females [8,12].

Furthermore, the risk of developing CRC is 25% higher in people with previous history of adenoma or adenocarcinoma [12]. Multiple types of polyps may be present: Some are precancerous and some are benign like hamartomas, inflammatory and mucosal polyps. The adenomatous types of polyps are the most common with different pathologies of which some are malignant [12]. Villous are of high degree of atypia whereas lesser degree of atypia is found in tubular adenomas [12,26]. In our study 7% of the detected polyps are adenomas in which 20% were with dysplasia. Two percent were adenocarcinoma, which is proven in other studies to be of similar percentage.

The presentation of colorectal cancer or polyps may differ between patients. The main indication is GI bleeding which is the most common symptom of presentation specially to the emergency department [3]. As our data showed the percentage of people with colonic polyp/CRC who present with gastro-intestinal bleed is 37.75%. Other initial symptoms were also presented but with a smaller percentage. Even though the mainstay of prevention of CRC is the early detection of a colonic polyp either through screening

or surveillance, it was not highly shown in our study. Only about 25% of patients presented for surveillance or for screening. The U.S preventive task forces recommends colonoscopy every 10 years for people above 50 years of age [4]. Compared to our data a hypothesis rises to say that more awareness campaigns to perform colonoscopy as a screening method are needed among the Lebanese population, especially for those who do not seek medical advice due to their financial status.

As for proper bowel preparation, it plays a significant role in detecting polyps [14]. In our study 95.1% of the patients were adequately prepared. Proper bowel preparation is defined as cleaning of the bowels until colonic polyps measuring 5mm and above can be detected [14]. Polyps were detected in 25.5% of the studied population, with significant relation p- value <0.05 in this study. Concerning cecal intubation, this procedure allows higher detection of polyps, confirms proper preparation, and allows better visualization to larger space [14]. In our study cecal intubation was done in 96.38% which confirms the success of the colonoscopy. As an overall sum up, the key to a good colonoscopy procedure is both cecal intubation and proper preparation. The use of aspirin before colonoscopy increases risk of post colonoscopy and post polypectomy bleeding [46]. Eighty-one percent of the participants did not use aspirin prior to colonoscopy but no further data was collected to detect whether bleeding occurred in those who were using aspirin.

As for the treatment of colon ca, it depends on the stage at which it was detected. For colonic polyps, polypectomy is the least invasive. It allows the removal of polyps 5 mm and above [26]. No further data are collected in our research to compare the percentage of polypectomy done and whether complications occurred or not.

Conclusion

In conclusion, colonic polyps and colon ca are a major issue to be discussed, studied, and evaluated worldwide. It is a common disease with high mortality rates worldwide and specially in Lebanon. The early detection of the disease allows a less invasive method of treatment, a more rapid healing period, a longer lifespan and lower mortality rates. Early detection can be obtained by multiple methods such as fecal occult blood test, computer tomography of the abdomen, and colonoscopy which remains the gold standard. The main issue is that early symptoms may be absent, mild or non-

specific and people only seek medical advice when their symptoms become more severe such as weight loss, gastro-intestinal bleed and bowel obstruction. In Lebanon, people are not very aware of colorectal cancer frequency, its symptoms, screening methods and the importance of early detection. The majority of Lebanese population are ignorant about the seriousness of a positive occult blood or FIT test. Concisely, this is a topic to be furtherly elaborated.

Besides, knowing the great benefits colonoscopy has demonstrated in terms of early detection and therefore better prognosis of colorectal cancer, further care must be given by the governmental health society to make it more available and affordable to all social classes.

To end with, Colorectal cancer awareness campaigns should be raised more in Lebanon on TVs, radios and social media in English, French and most importantly in Arabic to reach women and men of all educational and academic status.

Study Limitations

This is a monocentric study confined to only Bsalim Middle East Institute of Health, which makes our study group a non-reliable representative sample of the Lebanese population as a whole. A larger study group from different hospitals across the country is deemed essential. Another limitation was the lack of follow up for post colonoscopy outcomes in terms of complications or treatment options and its relation with survival rates.

Study Perspectives

Further studies on the treatment methods and behaviors following colonoscopy should be done. Additionally, awareness campaigns, if risen, will play an important role in increasing participation in future screening projects that help in detecting CRC at very early stages when it is highly curable. Besides, knowing the great benefits colonoscopy has demonstrated in terms of early detection and therefore better prognosis of colorectal cancer, further financial care must be given by the governmental health society to make it affordable to all social classes.

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Conflict of Interest of All Authors

None.

Ethical Consideration

A proposal detailing the background, objectives and methods of the study was sent to the IRB committee of the Middle East Institute of Health. The study protocol was reviewed and approved by the institutional review board.

Consent

After having the purpose and methods of the study explained, a full clear consent was obtained from participants.

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