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Table of Contents

Original Articles

Survival outcomes and prognostic factors of extragonadal germ cell tumors: An institutional experience over a decade. 07

S. Bindhu, Meher Lakshmi Konatam, Rachana Chennamaneni, Sadashivudu Gundeti

Baroreflex Sensitivity, Vascular Status, and Cardiorespiratory Fitness

In Breast Cancer Survivors – A Cross–sectional Analytical Study 15

Aashish S Raman, Rajalakshmi Rajasegaran, Govindarajan Vishnukanth, Rajeswari Aghoram, Biswajit Dubashi, Usha Dhanaradja, Allen Timothy

Patterns and Trends of Colorectal Cancer in the United Arab Emirates: A Retrospective Cohort Study, 2012–2021 23

Ahmad Amrou, Ali Al–Najjar, Rachid Kaddoura, Masa Alashkar, Zainab Al–Abdullah, Samuel B. Ho,

Neshteman Oghanna, Faisel Ikram, Shroque Zaher

Cytotoxic Effect of Chemotherapy in Women with Breast Cancer in the Wilaya of Oran 31

Fatima Zohra Tahari, Asmahane Medjdoub, Zineb Tahari, Fatima Zohraa Boussouf, Saddek Yahia, Houria Ouldcadi, Tewfik Sahraoui.

Outcomes of Radiotherapy for Early–Stage Laryngeal Cancer: A 12–Year Retrospective Review 37

Shehzad K, Alrajhi N, Alwhaid M, Alnagmy A, Shehadeh M, Alsemali, Gamal M, Aldehaim M

Utility of specific human papilloma virus DNA PCR to detect HPV in oral squamous cell carcinoma 48

Doshi Preeti, Lakhe Rachana, Christopher Annu, Jain Avantika, Bharadwaj Reena P

Clinical Spectrum of Sarcoma in the Sultanate of Oman 53

Dr. Maitha Al Sibani, Dr. Ajit Venniyoor, Dr. Kawther Al Lawati, Dr. Ahmed Al Lawati, Maryam Al Nabhani

Comparative Efficacy and Toxicity of Gemcitabine–Cisplatin vs. Gemcitabine–Carboplatin

in Metastatic Carcinoma of the Urinary Bladder: A Retrospective Review.....60

Varun Goel, Arpit Jain, Dharmistha Basu, Nivedita Patnaik, Vineet Talwar, Siddhant Swamy, Dr Sudhir Rawal

Case Report

FH–Deficient Uterine Leiomyomas: Pathological Insights into a Rare Tumor 67

Fatima Shamsuddin, Meera Balakrishnan, Smiley Annie George

Primary Squamous Cell Carcinoma of the Thyroid: A Rare Subtype of Anaplastic Carcinoma 72

Fatima. Safini, Achraf. Miry, Zainab. Oumouloud, Ghizlane. Ennibi, Sanae. Abbaoui, Bouchra. Amaoui.

Conference Highlights/Scientific Contributions

- **News Notes.....76**
- **Advertisements 80**
- **Scientific Activities 81**

Original Study

Patterns and Trends of Colorectal Cancer in the United Arab Emirates: A Retrospective Cohort Study, 2012–2021

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Abstract

Background: Colorectal cancer (CRC) is the third most diagnosed cancer and the second most fatal cancer worldwide. Recent data indicate that colorectal cancer incidence may be increasing in younger age groups. Our primary objective was to assess patterns and trends of colorectal cancer in a tertiary care hospital in Dubai.

Methods: Retrospective cohort study, where data from 560 patients diagnosed with CRC in a tertiary care hospital in Dubai, United Arab Emirates (UAE) from 2012 up to 2021 were analyzed. Studied data included sociodemographic, clinical, and histopathologic variables.

Results: The incidence rate of CRC cases increased from 29.9 cases per 1000 patients in 2012 to 118 cases per 1000 patients in 2020, followed by a decrease in 2021 following the COVID–19 pandemic. The frequency of CRC was higher among males (56.4%) compared to females (43.4%). The mean age of patients was 54.8 years old (SD = 13.7). Prevalent nationalities included Emirati (21.6%), Indian (10.4%), and United Kingdom (UK) (8.8%). 175/406 (43.1%) had locally advanced disease (pT4) and 134/424 (31.6%) had metastatic disease at presentation. The percentage of CRC cases diagnosed at ages less than 50 years was consistently high over time, ranging from 24–50% of total CRC cases.

Discussion and Conclusion: The results indicate an alarming increase in the incidence of CRC, including within the younger population aged ≤50 years. CRC incidence increased from 2012 through 2021 in this tertiary center in Dubai and was common in younger age groups, with the majority diagnosed in advanced stages. This indicates the need for increased screening in this region.

Keywords: Colorectal neoplasms, Epidemiology, Screening, United Arab Emirates, COVID–19

Background

Colorectal cancer (CRC) is the third most diagnosed cancer worldwide, and there were an estimated 1.9 million new cases recorded in 2020[1]. Global patterns vary and are linked to the human development index level, reflecting the implementation of Western lifestyles that accompany economic transition and elevate the risk of CRC. In general, CRC incidence is rising in low–income and middle–income countries and is stable to declining in high–income countries, especially those that have implemented screening[2]. However, accumulating evidence from studies of cancer registry data indicates that favorable overall trends are masking an increase in young–onset CRC[3–5]. Although the absolute risk of CRC in adults younger than 50 years remains low relative to older adults, recent disease trends in young age groups may indicate that the population is being exposed to new risk factors [6].

A study conducted by Araghi et al. indicated that, even with the decreasing CRC mortality rates observed, an overall increase in mortality caused by CRC from 2013 to

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2035 is predicted in the majority of countries, likely due to changes in population numbers and aging[7]. The rates of CRC deaths are expected to increase specifically in Latin American and Caribbean countries, whereas rectal cancer deaths alone are on the rise in Australia, Canada, and the United States. Akimoto et al. documented the increasing incidence of early–onset colorectal cancer in both men and women, particularly in the developed world and in non–Hispanic white persons[8].

To date, there have been no recent reports from the UAE looking at the temporal trends in CRC. This study aims to investigate the demographics of CRC in one large multispecialty hospital in the UAE.

Material and Methods

Study design and Setting

Retrospective cohort study with incidence data obtained from 560 patients diagnosed with CRC in a single group of tertiary–care private hospitals in Dubai, UAE in the 10 years between 03 April 2012 and 07 September 2021. 560 Patients who have been diagnosed with biopsy–confirmed CRC (gold–standard pathology diagnosis) either in the country or from other regions with a pathology report. Patient data were extracted regardless of the department of admission (oncology, gastroenterology, general surgery, and other departments). Patients' ages were clustered into 10–year–range groups. Additional data were obtained by accessing electronic medical record data. The study was approved by the MBRU Institutional Review Board (MBRU IRB–2021–4), the Mediclinic Institutional Review Board (MCME.CR.184.MCIT.2021), and the Dubai Scientific Research Ethics Committee (DSREC), Dubai Health Authority (Study DSREC–06/2022_13).

Variables

Sociodemographic variables included age, gender, and nationality. Variables of CRC were classified as pathological and clinical. Pathological variables included the histological type, grade, and stage of the tumor; whilst clinical variables contained the mode of clinical presentation, site of the tumor, and presence of metastases. The modes of clinical presentation were grouped into 5 major categories: rectal bleeding, bowel habit changes, weight loss, positive fecal occult blood test, and others. The 'others' category included but was not limited to pain, weakness, anemia, fever, nausea, and decreased appetite. Defecation frequency changes, fecal incontinence, stool consistency, and stool color were included under changes in bowel habits. Note that screening colonoscopy was not an approved indication in this population during this period and generally was not performed. Stage of tumor was based on depth of invasion (T) and lymph node metastasis (N) and was coded as: 1 – which includes T1, T2, or T3 tumors with no nodal involvement (N0); 2 – which includes T4 tumors with N0; 3a/3b – which includes T1, T2, or T3 tumors with N1 or N2; and 3c/4 – which includes T4 tumors with N1 or N2. The presence of metastasis, irrespective of TNM staging, led to the staging of code 4. Sites of tumors were grouped under the cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectosigmoid junction, and rectum. Sites of tumors were also grouped into the right and left colon, where the right colon encompassed the cecum, ascending colon, and transverse colon, and the left colon included the descending colon, sigmoid colon, rectosigmoid junction, and rectum. The presence of metastasis of CRC origin was taken into account, regardless of the site of metastasis. Appendiceal tumors were not included in the study.

Data sources/measurement

Secondary data were retrieved from tertiary–care hospitals' electronic medical records (EMRs) from 2012 to 2021. EMRs were accessed through the hospital's computers, and relevant data were then extracted onto a Microsoft Excel sheet.

Study size

The study sample included all CRC subjects who were identified in the tertiary care hospital EMRs. The total number of cases identified within Mediclinic EMRs has been narrowed down from 784 to 560 patients due to the absence of CRC diagnosis in the records warranting exclusion from the study (*i.e.*, presence of primary non–CRC diagnoses such as colorectal secondary tumors, other abdominal primary tumors, and other false labeling).

Quantitative variables

Patients were stratified by age groups with a total of 11 age groups, each comprising a 10–year interval starting from 0 to 109 years. In terms of the date of diagnosis of patients, data of all patients that have been diagnosed in a certain year were obtained and compared to other years allowing for better observation of patterns and trends.

Statistical methods

Data were extracted to Microsoft Excel and then to SPSS software where they were analyzed. Frequency was calculated by gender, nationality, etc. to study the association between sociodemographic variables. The Chi–square test was calculated with a p–value of ≤ 0.05 selected as statistically significant. A two–sided t–test with p–value (significance = ≤ 0.05) was used to compare male and female mean age. The crosstabulation

feature on SPSS was used to look at correlations between variables like age group and gender, as well as gender and metastases, with p–value (significance = ≤ 0.05). The statistical methods of this study were assessed by Professor Jeyaseelan Lakshmanan from Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU).

Results

Participants

Of the 784 patients initially identified for the study, 217 were excluded as they did not have a primary CRC diagnosis, and 7 other patients with appendiceal cancer were excluded. This yielded a total of 560 patients who were diagnosed with CRC throughout the 10 years from 2012 to 2021. Out of the 560 cases, 445 had available information on the histological type of tumor, 346 on the grade of tumor, 406 on the stage of the tumor, and 506 on the site of the tumor. With regards to the mode of clinical presentation, information was available for 389 patients. The data obtained was limited to what was found at presentation, whereas data as time progressed or after treatment were beyond the scope of this study. We also obtained the number of unique patient visits at the facility from 2012 through 2021 from the Mediclinic data repository which ranged from 66,881 patients in 2012 to 83,004 patients in 2021.

Patient characteristics

The rate of CRC was higher among males compared to females, with males being 316 (56.4%), and females being 243 (43.4%) [Table 1]. The mean age (± SD) of patients was 54.8 (± 13.7) years. Independent t–test showed the mean age (± SD) of males to be 56.64 (± 13.05), and the mean age (± SD) of females to be 52.56 (± 14.34), (p–value 0.015). A cross–tabulation between ages of less and more than 50 with gender showed that there were 109 females and 90 males diagnosed with CRC below the age of 50 (*i.e.*, EOCRC) (p–value <0.001). Frequent nationalities included Emirati (21.6%, n=121), Indian (10.4%, n=58), and British (8.8%, n=49). The most prevalent histological type of tumor was adenocarcinoma in 435/450 (97%) patients, followed by neuroendocrine tumor with 4/450 (0.9%), and mixed adeno–neuroendocrine with 2/450 cases (0.4%). At presentation, 123/406 (30.3%) had early stage 1,2 disease, and the remainder presented with advanced disease (108/406 (26.6%) with stage 3a/3b and 175/406 (43.1%) with stage 3c/4). Overall, 267/346 (84.4%) presented with moderately differentiated (grade 2) tumors, 43/346 (13.6%) presented with well–differentiated (grade 1) tumors, and 36/346 (11.3%) presented with poorly differentiated (grade 3) tumors. Most tumors arose in the left colon (76.3%, n= 386/506), with the most frequent site of tumor being the sigmoid colon (29.6%, n=150/506), followed by rectum (27.3%, n=138/506), and rectosigmoid (11.9%, n=60/506); and 120/506 (23.7%) of tumors were localized in the right colon. The most frequent mode of clinical presentation in 160/389 (41.1%) was changes in bowel habits, followed by 157/389 (40.4%) with rectal bleeding. Only 6.7% (26/389) had a positive fecal occult blood test obtained through screening, and 228/388 (58.8%) presented with other modes of clinical presentation.

The number of patients diagnosed with CRC over time is presented in Figures 1 and 2. Over this period, the absolute number of cases diagnosed yearly increased up to 4.3–fold from 2012 until the onset of the COVID–19 pandemic. Compared with the total number of unique patient visits to City Hospital per year, we observed an overall increase in the percentage of CRC cases diagnosed each year through 2020 (figure 2). For example, the percentage was lowest in 2012, at 0.029% or 0.30 cases per 1000 patients, which increased to 0.118% or 1.18 cases per 1000 patients in 2020. This indicates that, even with the growing population in Dubai, the incidence of CRC cases has been increasing as a percentage of the total patient population in this hospital. Notable during this time is that the percentage of patients with CRC younger than 50 years old ranged from 24–50%. A sharp decline in CRC cases was noted in 2021, likely due to altered referral patterns with the onset of the COVID–19 pandemic.

Discussion

This research has found a significant rise in the number of patients diagnosed with CRC from 2012 through the onset of the COVID–19 pandemic in 2020. Most CRC patients were males, most cancers occurred in the left colon, and a large percentage were at an advanced stage when diagnosed. In addition, we documented a relatively high percentage of CRC cases in patients aged less than 50, which remained consistent throughout the period observed. These data are in keeping with an increase in cases of CRC reported to the UAE national registry from 2011 to 2015, with 36% of cases occurring in patients less than 50 years old[9].

Siegel et al. observed in recent US cancer statistics that despite an earlier decline of 3–4% of CRC cases annually observed during the 2000s, the decline has been observed overall to be 1.3% (men) and 1.5% (women) annually since 2011. Despite an overall declining incidence, the incidence of CRC in individuals younger than 55 years has been observed to increase by 1–2% per year since the mid–1990s, with the proportion in this younger age group increasing from 11% in 1995 to 20% in 2019. In

Variables	Age < 50	Age ≥ 50	P–Value
Gender			
Males	N=90 (45.2%)	N=226 (62.6%)	[a]P=<0.001
Females	N=109 (54.8%)	N=134 (37.1%)	
Grade			
Grade 1	N=12 (9.9%)	N=31 (13.8%)	
Grade 2	N=92 (76.0%)	N=175 (77.8%)	P=0.187
Grade 3	N=17 (14.0%)	N=19 (8.4%)	
Stage			
Stage 1	N=34 (23.0%)	N=67 (26.0%)	
Stage 2	N=10 (6.8%)	N=12 (4.7%)	P=0.746
Stage 3a/3b	N=41 (27.7%)	N=67 (26%)	
Stage 3c/4	N=63 (42.6%)	N=112 (43.4%)	
Site			
Cecum	N=15 (8.2%)	N=25 (7.7%)	
Ascending colon	N=17 (9.3%)	N=30 (9.2%)	
Transverse colon	N=9 (4.9%)	N=24 (7.4%)	
Descending colon	N=12 (6.6%)	N=26 (8.0%)	P=0.812
Sigmoid colon	N=54 (29.7%)	N=96 (29.6%)	
Rectosigmoid junction	N=20 (11.0%)	N=40 (12.3%)	
Rectum	N=55 (30.2%)	N=83 (25.6%)	

Table 1. CRC–related variables in younger (<50 years) and older (> 50 years) age groups with p–values

[a] Significant P value

addition, the percentage of later–stage cancers has been increasing, along with a shift to left–sided cancers, for example, rectal cancers increased from 27% in 1995 to 31% in 2019[10].

The global rates of CRC incidence have recently been reported, with several countries reporting reduced overall CRC incidence since the 2000s, likely due to decreased smoking and increased CRC screening[1]. However, globally, the incidence of early–onset cancers has been documented to be increasing, particularly in Gulf countries. For example, from 1990 to 2019, the incidence of early onset cancers has increased by 896% in Saudi Arabia, 1089% in Qatar, and 1128% in the UAE[11]. Of early–onset cancers, CRC is among the top four; the others are breast, lung, and stomach[11]. An increasing incidence of early–onset CRC has been well–documented in numerous other countries[12, 13]. Although the reasons for an increase in CRC in younger populations are not fully understood, potential contributors include dietary factors, alcohol consumption, and rising obesity rates[11, 14]. The increase in early–onset CRC incidence contributed to a 2018 American Cancer Society (ACS) recommendation to start CRC screening at age 45 instead of 50 years in persons at average risk[15].

These statistics are particularly relevant in countries where a high percentage of the population is composed of young people. For example, the UAE has a high rate of young people (age < 50) diagnosed with CRC. Much of this may stem from the fact that 67% of the population is aged 25–55, 5.3% are 55–64, and only 1.3% are > 65 years old[16]. Overall 74% of the population is male in those aged > 25, and 89% of individuals are expatriates, representing around 200 different nationalities (with approximately 54% from the Indian subcontinent, 8% from Asia, 9% from Middle East region, and 18% from Western or other regions). Thus, the higher percentage of early–onset CRC may reflect the higher relative percentage of young people in this population.

The clinical spectrum of CRC reported in the current study is like that reported in other countries of the Gulf region. As shown in Table 2, our study found that adenocarcinoma constituted the majority (97%)

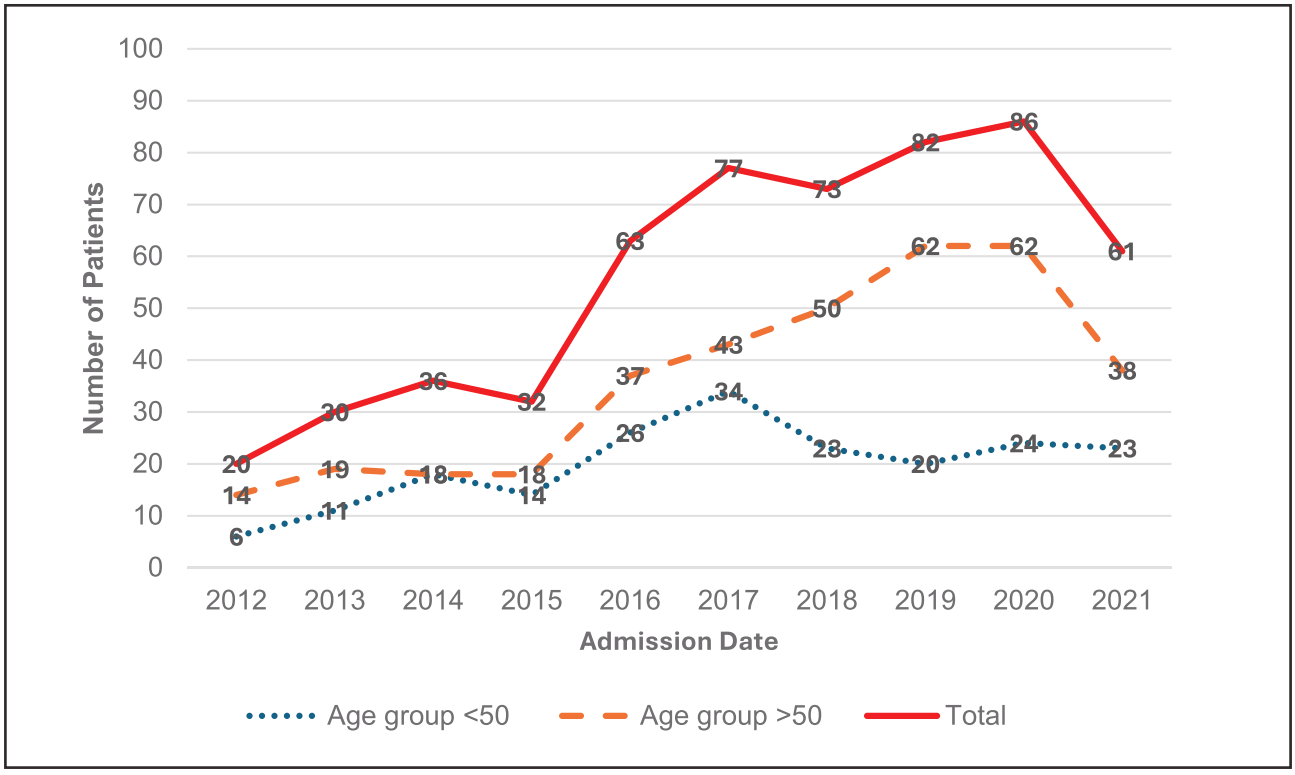


Figure 1: Trends in admission of CRC patients by age group from 2012 to 2021

Legend: Line graph showing the frequency of CRC patients admitted to a tertiary care hospital in Dubai, UAE from 2012–2021 grouped by the age of less than 50 (blue dotted line), age greater than or equal to 50 (orange dashed line), and the total of both age groups (red solid line). The x–axis represents the time in years from 2012 to 2021, and the y–axis represents the number of patient admissions in increments of 10. The number of admissions in the greater than 50 age group is higher than the less than 50 age group in all years except 2014, with 18 admissions in each age group

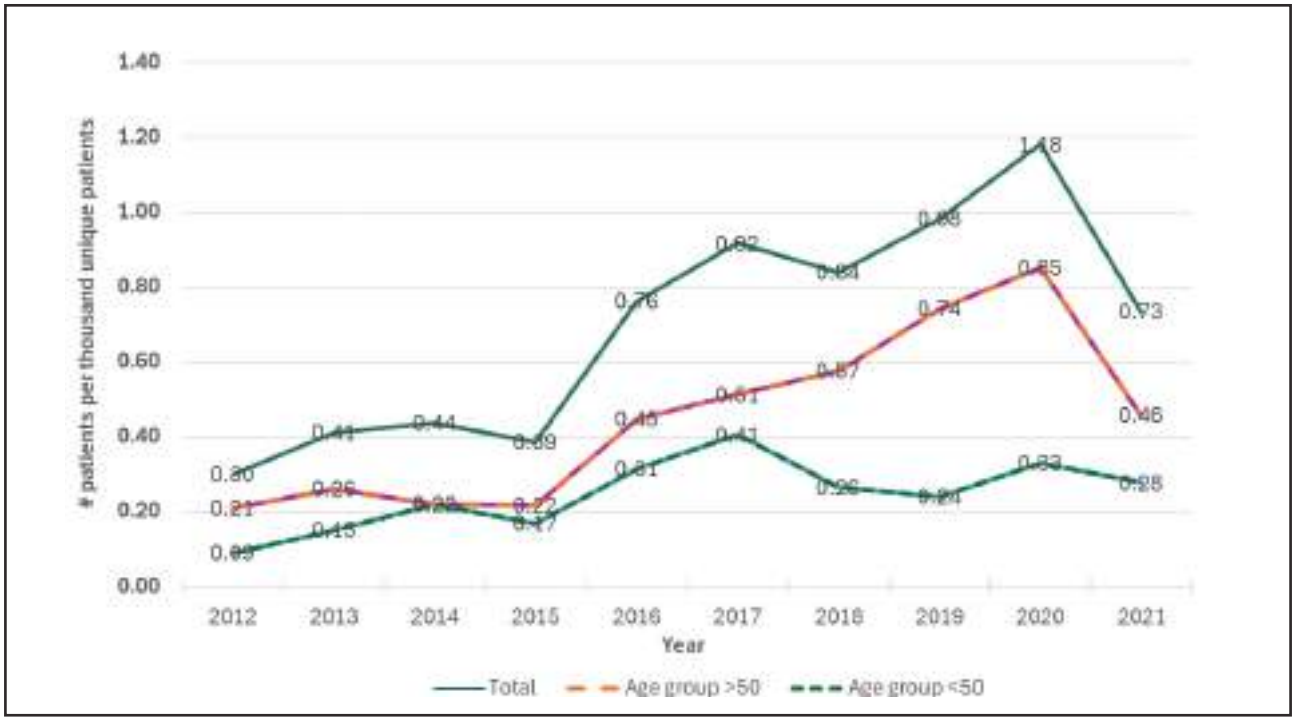


Figure 2: Incidence of newly diagnosed CRC cases per year from 2012 to 2021

Legend: Line graph displaying the number per thousand of newly diagnosed CRC patients per the total number of unique patients by year from 2012 to 2021. The graph shows a steady increase in the incidence of newly diagnosed CRC cases per year, with the highest percentage being in the year 2020.

of tumors. Similar results were found in Bahrain[17], where 96/97 (99%) had adenocarcinoma, whereas one study in the Kingdom of Saudi Arabia (KSA)[18] reported 73% with adenocarcinoma [Table 2]. Furthermore, several studies reported that patients tend to present with advanced–stage disease[19]. In KSA, more patients who are older than 45 years had advanced–stage disease than younger patients[18]. Similarly, our study revealed that there was a slightly smaller percentage of patients with stage 4 disease under 50 years as compared with those above 50. In contrast, another retrospective single–center study from the US found that advanced–stage tumors were more common among patients younger than 50 years than those who are older[20].

Finally, we observed a significant decrease in CRC patients after 2020. Similar decreases have been widely documented in other countries following the beginning of the COVID–19 pandemic. For example, compared to 2019, the monthly number of 2–week referrals for CRC suspicion and the number of colonoscopies in England dropped in April 2020 by 63% and 92%, respectively[21]. At the onset of the COVID–19 pandemic, cancer reporting was affected nationwide in the US due to a decrease in referral and screening[22]. The decline in screening has been recognized as the target of quality improvement efforts to make up for this deficit[23]. There is little data available concerning the cumilative changes in colorectal cancer incidence over time in the United Arab Emirates. The UAE Ministry of Health reported in 2019 a total of 413 diagnosed cases of colorectal cancer (69% non–Emirate, 31% Emirati)[24]; and in a subsequent communication in 2021, a total of 532 diagnosed cases of colorectal cancer were reported (70% in non–Emirati and 30% in Emirate populations). The World Health Organization (WHO) Globoscan report indicated that there were 550 new cases of colorectal cancer in the UAE in 2022, which was the second–ranking cancer among both males and females and represented 10% of total new cancer cases[25]. These data indicate that the total reported cases have increased in recent years. However, this may reflect growing populations of the UAE. For example, the population of Dubai from 2000, 2010, and 2020 has been estimated to be 862,387, 1.9 million, and 3.4 million, respectively[26]. More efforts are needed for accurate tracking of changes in cancer incidence on a per capita basis, both nationally and regionally.

The strength of this study is the novel data related to colorectal cancer diagnoses in a multi–ethnic, multi–cultural region with few prior studies. In addition, we report an increase in the incidence based on the total patient population in our hospital. This study also sheds light on the implications of the need for population screening in this region. Limitations included missing data for many variables due to the lack of information available in the medical record, the limited data source from a single private tertiary care hospital, and the lack of data before 2012. This restricts the study's generalizability to public hospitals and different cities of the UAE; it also creates bias due to demographic differences from private sector to public sector healthcare centers. Similar studies from public sector hospitals are needed.

This study reveals that only a minority of patients with CRC were diagnosed through screening, emphasizing the need for enhanced patient education on CRC and the importance of screening. Awareness campaigns in the UAE should target not only high–risk individuals but also the general population. Education should also focus on common CRC symptoms like abdominal bloating, hematochezia, and changes in bowel habits and on modifiable risk factors, including diet, lifestyle, and environmental exposures. Such factors include Western diets, consumption of red and processed meat, smoking, obesity, alcohol, sedentary habits, and reduced intake of whole grains, calcium, and milk. Education should also focus on non–modifiable risk factors involving genetic predispositions and family history, with nearly 30% of early–onset CRC patients having a first–degree relative diagnosed with CRC.

Future research should explore the higher incidence of CRC among younger patients and conduct prospective cohort studies to gather comprehensive data. Establishing a cancer registry across multiple sites in the UAE would aid future research. The study underscores the need for CRC education and guideline–based screening programs in the region.

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Variables	UAE	UAE (1985–1998)[27]	Oman[19]	KSA[18]	Bahrain[17]
Gender					
Males	N=316/560 (56.4%)	N=77/114 (68%)	N=95/162 (58.6%)	N=2274/4201 (54.1%)	N=48/97 (49.5%)
Females	N=243/560 (43.4%)	N=37/114 (32%)	N=67/162 (41.4%)	N=1927/4201 (45.9%)	N=49/97 (50.5%)
Mean Age (years)					
	54.8		N/A	58	60
Histological Type					
Adenocarcinoma	N=435/445 (97.8%)	N=103/114 (90%)	N/A	73%	N=96/97 (99%)
Grade					
1	N=43/346 (12.4%)	N=53/114 (46%)	N=9/162 (5.6%)	N=541/4201 (13%)	N=3/97 (3%)
2	N=267/346 (77.1%)	N=51/114 (45%)	N=125/162 (77.2%)	N=2562/4201 (61%)	N=81/97 (84%)
3	N=36/346 (10.4%)	N=10/114 (9%)	N=27/162 (16.7%)	N=343/4201 (8%)	N=4/97 (4%)
Stage					
1	N=101/406 (24.9%)	N=8/114 (7%)	N=9/162 (5.6%)	N/A	N=3/97 (3%)
2	N=22/406 (5.4%)	N=34/114 (30%)	N=28/162 (17.3%)	N/A	N=10/97 (10%)
3a/3b	N=108/406 (26.6%)	N=72/114 (63%)	N=69/162 (42.6%) (stage 3)	N/A	N=20/97 (21%) (stage 3)
3c/4	N=175/406 (43.1%)		N=53/162 (32.7%) (stage 4)	N/A	N=18/97 (19%) (stage 4)
Site					
Right colon	N=120/506 (23.7%)	N=38/114 (33%)	N=42/162 (25.9%)	14% (isolated)	N=17/74 (23%)
Cecum	N=40/506 (7.9%)	N/A	N=0/162 (0%)	N/A	N/A
Ascending colon	N=47/506 (9.3%)	N/A	N=34/162 (21%)	N/A	N/A
Transverse colon	N=33/506 (6.5%)	N/A	N=8/162 (4.9%)	N/A	N/A
Left colon	N=386/506 (76.3%)	N=76/114 (67%)	N=120/162 (74.1%)	N=2856/4201 (68%)	N=57/74 (77%)
Descending colon	N=38/506 (7.5%)	N/A	N=29/162 (17.9%)	N=252/4201 (6%)	N/A
Sigmoid colon	N=150/506 (29.6%)	N/A	N=43/162 (26.5%)	N=798/4201 (19%)	N/A
Rectosigmoid colon	N=60/506 (11.9%)	N/A	N=0/162 (0%)	N=630/4201 (15%)	N/A
Rectum	N=138/506 (27.3%)	N=41/114 (36%)	N=48/162 (29.6%)	N=1176/4201 (28%)	N=20/74 (27%)
Metastasis					
	N=134/424 (31.6%)		N=53/162 (32.7%)	N=1018/4201 (24%)	N/A
Clinical presentation					
	changes in bowel habits (41.1%)	N/A	N/A	N/A	rectal bleeding with anemia N=29/97 (30%)
	bleeding per rectum (40.4%)	N/A	N/A	N/A	constipation N=10/97 (10%)
		N/A	N/A	N/A	Abdominal pain N=5/97 (5%)

Table 2. Comparison of findings to other studies from Bahrain[17], KSA[18], Oman[19], and the UAE[27].

UAE: United Arab Emirates; KSA: Kingdom of Saudi Arabia

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