

Epidemiology of Rectal Cancer Patients in the Kingdom of Bahrain: A Retrospective Cohort Study

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ABSTRACT

Aim and background: As rectal cancer diagnosis becomes more prevalent due to the increased awareness caused by campaigns, this study aims to focus on the demographics of patients diagnosed with rectal cancer in the Kingdom of Bahrain

Methods: A retrospective cross-sectional study design was conducted on 184 patients diagnosed with primary or second primary rectal cancer. Stage and site of tumor at diagnosis, gender, BMI, family history, histology, and metastasis are discussed throughout the paper.

Results: The majority of the population (85.9%) were Bahraini, with males (57.6%) being more prevalent. A little over 50% of patients diagnosed with rectal cancer were aged 60 years or younger. In most cases, the tumors were spotted in the lower rectum (48.9%) and were diagnosed by the appearance of symptoms (91.8%). Kaplan–Meier Survival analysis showed that the overall survival for males is 95.3% and for females 93.6% for 1 year.

Conclusion: The high number of Bahraini males diagnosed with rectal cancer highlights the importance of early screening and detection. The prevalence of the tumor in the lower rectum suggests the need for improved education on recognizing symptoms and seeking medical attention. Further research is required to establish a comprehensive national screening program for rectal cancer in Bahrain.

Clinical Significance: Understanding the demographic and clinical characteristics of rectal cancer patients in the Kingdom of Bahrain is required to target early screening and public awareness. The findings of this study provide a solid foundation for future developments in rectal cancer diagnosis and treatment to improve survival outcomes.

Keywords: Bahrain, Cancer of rectum, Colorectal cancer, Rectal cancer, Rectum cancer.

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INTRODUCTION

Colorectal cancer is the third most commonly diagnosed cancer in Europe and the United States. It is the fourth most common cause of cancer-related deaths in the world.^{1–4} According to the Bahrain National Cancer Registry 2020, colorectal cancer in males is the first common cancer diagnosed and the second most common cancer diagnosed in females.⁵ Studies specific to rectal cancer can be investigated independently from colon cancer due to its distinct embryology, pattern of metastasis, and treatment plans.⁶

It has been noted that rectal cancer is becoming more prevalent, especially in the younger population group (<45 years), which may lead to an unfavorable outcome due to the aggressive nature of the disease.^{4,6} Like many cancers, rectal cancer risk also increases with age, as patients over the age of 50 have a higher risk of developing the disease.^{4,6,7} Many studies have shown a demographic relationship between developing rectal cancer and risk factors such as being male, smoking, and comorbidities like obesity, inflammatory bowel disease, and hypertension.^{3,4}

The diagnosis of rectal cancer can be challenging when considering the demographics of the population. The current literature primarily discusses the link between colorectal cancer and several modifiable lifestyle factors such as smoking, and diets rich in meats.^{3,8} Studies have also shown that rectal cancer is associated with a sedentary lifestyle, increased visceral adipose tissue, and increased BMI.⁸ Patients who are diagnosed with rectal cancer frequently present with symptoms such as rectal bleeding, altered bowel habits, abdominal discomfort, and symptoms of

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anemia, and may even present as a surgical emergency, such as bowel obstruction.⁹

Recent advancements in the awareness of rectal cancer through screening programs have successfully identified patients who are asymptomatic but are silently suffering from the disease. As a result of the increasing prevalence of asymptomatic rectal cancer

diagnoses in recent years, screening tests have been introduced in many countries.

This study aims to focus on the demographics of patients diagnosed with rectal cancer in Bahrain from the year 2019 to 2022. This study will contribute to the current knowledge of rectal cancer focusing on areas such as patient demographics, histology, and diagnostic techniques. Due to the nature of the study, we aim to gain better insights into the demographic factors of rectal cancer in the Kingdom of Bahrain.

METHODS

A retrospective cross-sectional study was conducted at King Hamad University Hospital (KHUH). Ethical Approval was granted by the KHUH Institutional Review Board (IRB#23-574). Data were extracted from the hospital's online electronic medical system by ICD-10 codes (C20, C21). Data were further cleaned based on the inclusion and exclusion criteria, where a total of 184 patients were included.

The inclusion criteria consisted of patients diagnosed with a primary or a second primary rectal cancer between January 2019 and December 2022 and had a National Tumor Board (NTB) review. The NTB is a multidisciplinary team that reviews, discusses, and recommends the course of treatment for all cancer cases in the Kingdom of Bahrain. Patients who were treated conservatively such as those who refused surgery, or were deemed unfit (comorbid conditions, advanced age, or locally advanced disease) were included in this clinical audit. Patients who had a local recurrence that was confirmed after a complete response post-concurrent chemoradiotherapy, those deceased prior to treatment, and patients still receiving ongoing treatment in 2023 were also included in this study. Exclusion criteria included patients with cancer of other origins that had metastasized to the rectum, if the patient was diagnosed with colon or anal cancer, or those patients diagnosed before 2018 or after December 2022, who were all excluded from the study.

The specific parameters collected and analyzed for this study were age at diagnosis, gender, BMI, family history of colorectal cancer or other cancer, histology, follow-up, staging at the time of diagnosis, and the metastatic restaging after treatment. Metastasis was examined at restaging by surveillance imaging modalities such as PET scan, MRI pelvis, and/or MRI liver. The classification for disease presentation was categorized into symptomatic, screening with a fecal immunochemical test, or incidental findings on radiological scans such as MRI or CT or with colonoscopy.

The stage and the site of the metastases at the time of the diagnosis are included, for the most part, they were extracted from MRI pelvis findings, full body PET scan, or histology from biopsy. Histology was listed as adenocarcinoma, neuroendocrine, or other. The grading was recorded from the pre-resection biopsy and from the post-resection specimen as Grade I (well-differentiated glandular cells), Grade II (moderately differentiated), and Grade III (poorly differentiated). All histopathology was reviewed and recorded. The hospital location at the time of diagnosis was recorded as either at KHUH or outside of KHUH, whether that be another tertiary hospital in Bahrain or abroad. The exact location of the epicenter of the tumor was collected and defined as lower rectal (4–7.9 cm from the anal verge), middle rectal (8–11.9 cm from the anal verge), or upper rectal (12–15.9 cm from the anal verge). This data was collected primarily through MRI, but if not reported, colonoscopy and CT were used.

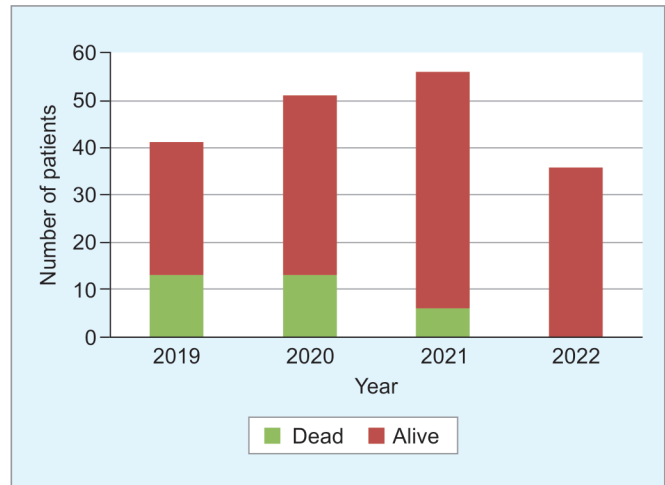


Fig. 1: Total rectal cancer cases included from January 2019 to December 2022

Another key area of focus for this clinical audit was the surveillance post-treatment and overall survival in our population. Follow-up was assessed at 30 days, 90 days, 180 days, 1 year, and 5 years. At the follow-up time increments, patients were categorized as either alive, deceased, lost to follow-up, or undetermined indicating that the time for the follow-up appointment has not been reached yet.

Statistical Analysis

Statistical analysis was completed by using SPSS v.28. Descriptive statistics were used to describe and summarize the collected data in a logical manner. The data was reported numerically in the manuscript text and/or in its tables, or graphically in as figures. The Kaplan–Meier method was used to estimate overall survival for 1 year and a log rank test was used to assess significance.

RESULTS

There was a total of 184 patients that were included in the study based on the inclusion criteria mentioned above. Figure 1 shows the total number of rectal cancer cases diagnosed by year. The majority of the population (85.9%) were Bahraini nationals (Supplementary Fig. 1). In the study cohort, males (57.6%) were more prevalent than females (42.4%), where the mean age was 59.1 ± 11.4 years for both (Supplementary Figs 2 and 3). The statistics we have shown for Bahrain, demonstrate a similar pattern to other studies with a 1.13:1 ratio of males to females.^{3,4,7,10} Surprisingly, over half of rectal cancer diagnosis was made in those 60 years of age or younger (51.1%). Furthermore, due to the increasing rate of obesity in the Kingdom of Bahrain, BMI was noted (Table 1, Supplementary Fig. 4).

A significant number of patients (23.4%) have a family history of cancer. Most of the cases were diagnosed by the appearance of symptoms (91.8%); meanwhile, the other cases were found through the screening campaign (3.8%) or through incidental colonoscopies (4.8%).

Of 184 cases, 25.5% were diagnosed at KHUH. The most common diagnosis was Stage III (65.8%) followed by a Stage IV diagnosis (19.6%), and a Stage I diagnosis (8.2%). (Fig. 2). The least common diagnosis was Stage II (6.0%). A few rectal cancer

Table 1: BMI classifications of rectal cancer patients in the Kingdom of Bahrain

Average BMI [m ± SD (min-max)]	27.4 ± 6.1 (13.0–50.7)
BMI scale (n = 168) (n,%)	
Underweight	9, 4.9
Normal	52, 28.3
Overweight	58, 31.5
Obese	49, 26.6

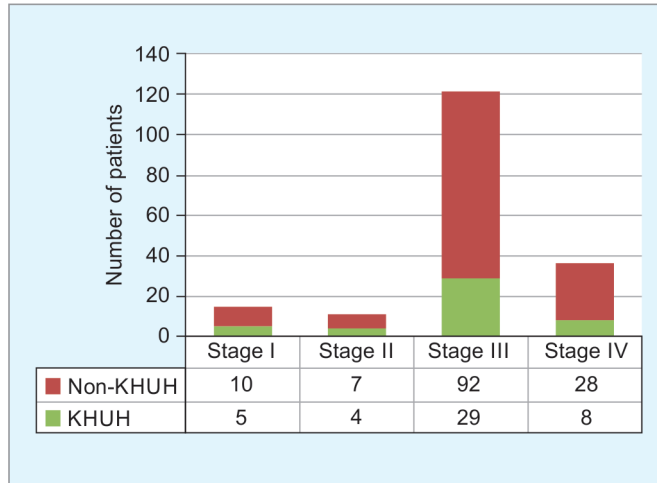


Fig. 2: Frequency of each stage at the time of diagnosis by the diagnostic center

Table 2: Secondary primary rectal cancer cases

No.	Gender	Age at Dx	Primary cancer Dx
1	F	60	Endometrial
2	F	60	Colon
3	M	59	Bladder
4	M	63	Thyroid
5	F	74	Colon
6	F	58	Colon
7	F	67	Breast
8	F	38	Thyroid
9	F	66	Breast
10	F	72	Multiple myeloma
11	M	79	Prostate
12	F	51	Lung
13	F	65	Breast
14	F	62	Breast

cases (8.2%) were diagnosed as secondary primary (Table 2). In most cases, the tumor was spotted in the lower rectum (50.0%) (Fig. 3).

The majority of cases diagnosed (97.8%) were adenocarcinoma, and it was mostly moderately differentiated (81.5%). Metastasis was noted for all patients who have completed treatment (n = 155), where 42.9% had M0 (Fig. 4, Supplementary Figure 5).

Kaplan–Meier Survival analysis was conducted where the population was categorized by gender for 1 year. There was a total of 10 deaths over the span of 1 year, of which 5 occurred in

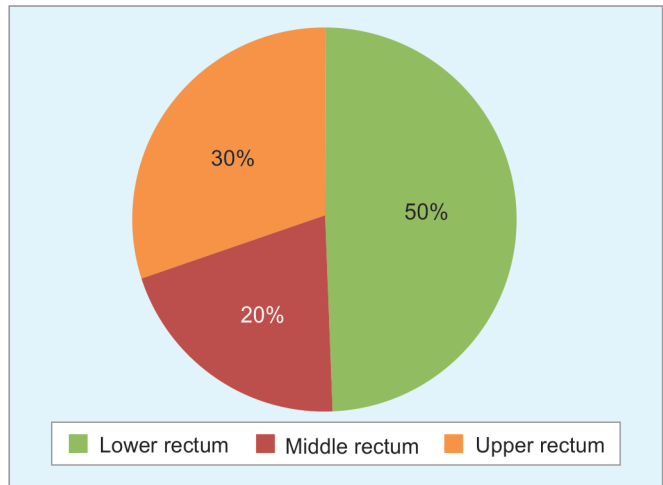


Fig. 3: Frequency of the site of tumor at the time of diagnosis

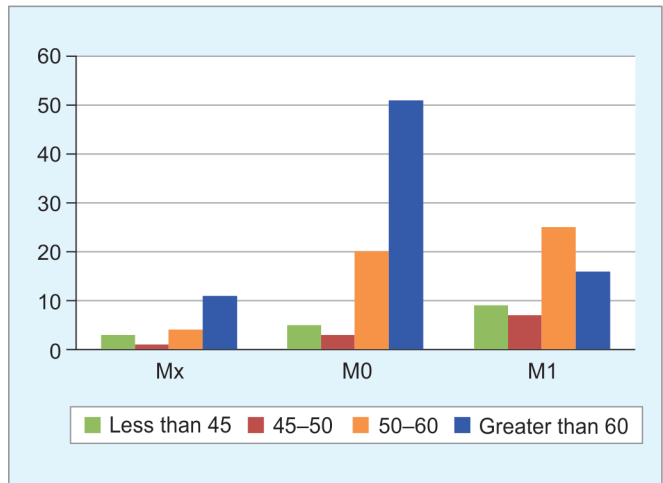


Fig. 4: Metastasis based on age

patients with a Stage III diagnosis and 5 occurred in patients with a Stage IV diagnosis. Results did not conclude any significance (p = 0.660) based on the log-rank test. The overall 1-year survival for males is 95.3%, and for females 93.6% (Fig. 5).

Table 3 shows the total number of cases seen based on the follow-up duration. There are a total of 32 deaths, setting the death rate for this population to be 17.4%. There are 27 patients who are lost to follow-up appointments, however, 85.3% of our patients have adhered to follow-up appointments.

DISCUSSION

This novel study conducted in Bahrain, highlights the ample information we can learn from, to gain knowledge on the local population, and thus improve cancer care in Bahrain.

In addition to the collection of this data, it is important to reflect on the influence of specialized cancer centers. The tasks and duties of accredited and certified centers can influence the quality of treatment processing and results required by healthcare policy.^{10,11} As a matter of fact, literature has observed that hospital case numbers, including physicians' individual case and operation numbers, as well as the specializations have a positive influence on morbidity and mortality.¹² In the Kingdom of Bahrain, it has been

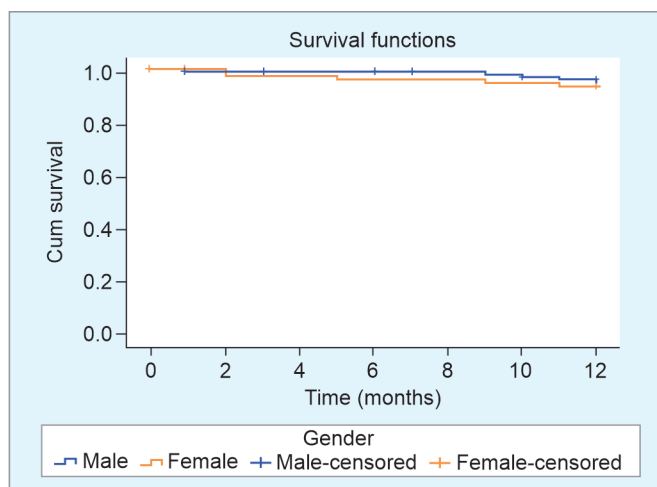


Fig. 5: Survival analysis by gender

Table 3: Patient follow-up adherence

Time point (months)	No. of patients	# of cases lost by cause		
		New deaths	Lost to follow-up	Time not reached
1	184 (100%)	–	–	–
3	173 (94.0%)	3	8	–
6	168 (91.3%)	–	5	–
12	159 (86.4%)	7	2	–
36	49 (26.6%)	28	14	68

observed that since the establishment of the Bahrain Oncology Centre in 2019, cases have increased yearly.

Data from the rectal cancer clinic in particular has shown rapid increases per year (Fig. 1). There was a notable decline in the incidence of rectal cancer in 2022, which is thought to be due to a rebound effect to those who presented in the year 2021 as it was observed to be the highest incidence of rectal cancer.

Awareness and Screening

The majority of rectal cancer cases were diagnosed through screening awareness campaigns in Bahrain over the past five years. Screening offers the potential for primary and secondary interventions, which is a public health challenge. Poor knowledge and awareness of colorectal cancer symptoms and risk factors in the Kingdom of Bahrain have been recorded. This indicates the shift in strategies towards the establishment of preventative measures and early detection.¹³

The diagnosis route that patients undertook was a fecal immunochemical test (FIT) in those aged ≥ 40 with an elevated risk due to family history in a first-degree relative. It has been observed that the population in Bahrain showed that 1 in 4 (23.4%) have a family history of cancer. In those with no family history, FIT tests are offered to all men and women >60 years of age. Men >60 will be encouraged to complete a colonoscopy every 5 years. Throughout the literature, FIT testing has been observed to be increasingly the most used colorectal cancer screening strategy; however, no screening strategy is clearly better than the others.¹⁴ Screening tests may include home kits testing fecal occult blood, sigmoidoscopy, and colonoscopy that are being performed between the ages of

50 and 75 to prevent late diagnosis of the disease and improve clinical outcomes.^{4,10,15}

Clinical Characteristics

Recent literature shows that prognostic factors affecting recurrence-free survival of rectal cancer patients are age, gender, genetics, BMI, pathology of primary disease, stage at the time of diagnosis, surgical management, and oncological management.^{16,17} In this study, we focused on gender, age, BMI, stage, and location of the diagnosis, as well as survival rates and adherence of follow-ups between patients.

As global research suggests that males have a higher incidence of rectal cancer,^{18–21} similar results can be seen in Bahrain, with the incidence of rectal cancer in males being 57.6% when compared to females. However, the average age of our population is 59.1 ± 11.4 years for both males and females. Recent studies have shown that the average age is between 37 and 47,^{22–24} indicating that rectal cancer is becoming more frequently diagnosed in a younger population regardless of gender.²⁵

Furthermore, the literature shows a clear link between developing rectal cancer and BMI; however, the use of BMI as a predictor of outcome is still controversial.^{4,3,8} Kalb et al. suggest there is an increased risk of developing rectal cancer in those with a BMI > 30 (obesity class I and II), as well as those with a BMI >35 (obesity class II) and a BMI <18 (underweight) have a significantly reduced 5-year overall survival rate.²⁶ The majority of our population (58.1%) had a BMI that is 25 or above, indicating that rectal cancer could be correlated to BMI categories (Table 1).

Our study indicated that the majority of the cases are diagnosed later resulting in more prevalence of stage III (65.8%) diagnosis, mostly in the lower rectum (Figs 2 and 3). A study done on colorectal cancer patients in the United States showed that 43% of stage III diagnoses were located in the rectum.²⁷ Moreover, the distribution of those presenting with metastasis showed the majority presented as M0 and are under the age of 60 (Fig. 4).

Survival analysis was done with the available data over 12 months, with the intention to observe disease-free survival rates in the population. Surprisingly, although males were more likely to be diagnosed with rectal cancer, they had a higher chance of disease-free survival (95.3%) when compared to females (93.6%) (Fig. 5). This analysis also noted adherence rates among the population to help further address trends of follow-ups (Table 3).

Limitations

One of this study's limitations is the lack of analysis of patient comorbidities. Comorbidities such as elevated BMI, cardiovascular disease, and diabetes are all well-known risk factors for rectal cancer. The relationship between any comorbidities and rectal cancer development has yet to be agreed upon, especially given the incidence of these comorbidities in general in Bahrain; however, given the statistical significance, it is something we must consider in future analysis of the data.

Moreover, since records of death are not maintained by the institute, it is hard to differentiate those who passed away from patients who are truly lost to follow-up due to other effects. This is a limitation of the study that influences survival analysis and adherence rates. Simultaneously, there may be additional cases that are not reflected upon in this study as they do not attend our institution. We recommend that future research on the clinical characteristics of rectal cancer use our results as a way to enhance the perspective of public health.

Implications

The diagnosis of rectal cancer can be influenced by the environment and risk factors prevalent in the demographics. As such looking into the factors that lead to a patient being diagnosed plays a pivotal role in the management and overall survival of the patient. This study examined preliminary data on rectal cancer patients identifying clinical characteristics of the Bahraini population. The authors suggest that future research should be targeted toward examining surgery techniques, treatment methods, management, and surveillance strategies, as well as advancements in public health interventions.

CONCLUSION

In our population, the majority of the cases were stage III at the time of diagnosis, necessitating the implementation of a comprehensive national screening program by addressing the identified gaps in screening, education, genetic counseling, and lifestyle modifications, the healthcare system can work towards reducing the incidence and improving the outcomes of rectal cancer in Bahrain.

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SUPPLEMENTARY MATERIALS

All the supplementary figures 1 to 5 are available on the website <https://www.ejohg.com/>.

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