Original Article

The Incidence and Pathological Characteristics of Colorectal Neoplasms in Excisional Biopsy Specimens Performed at Imam Khomeini Hospital during 2011-2023

Leila Naseri[1*], Mahsa Rizehbandi[2], Mohammad Reza Hafezi Ahmadi[3], Pardis Dolatyari[4], Seyyed Hossein Mirahadi[5]

[1]Assistant Professor of Anatomical Sciences, Department of Anatomical Sciences, School of Medicine, Ilam University of Medical Sciences, Ilam, Iran

[2]Assistant Professor of Internal Medicine, Department of Internal Medicine, School of Medicine, Shahid Mostafa Khomaeini Hospital, Ilam University of Medical sciences, Ilam,Iran.

[3]Professor of Pathology, Department of Pathology, School of Medicine Biotechnology and Medicinal Plants Research Center Emam Khomeini Hospital,Ilam University of Medical sciences

[4]Medical student, Ilam University of Medical Sciences, Ilam, Iran.

[5]MS in Anatomy, Ilam University of Medical Sciences, Ilam, Iran.

ABSTRACT

Background:
Cancers located in the main digestive tract include esophageal cancer, gastric cancer, colorectal cancer, rectal cancer, liver cancer, and pancreatic cancer. This study aimed to clarify this issue by examining trends in the incidence and histological characteristics of colorectal neoplasms in excisional biopsy specimens in Ilam province from 2011 to 2023.

Materials and Methods:
This study was conducted as a descriptive-analytical epidemiological study. We extracted the required histological data from histological reports of colorectal specimens obtained from excisional biopsies performed at Imam Khomeini Hospital (RA) and referred to this center's laboratory during 2011-2023.

Results:
Sampling activity peaked in 2011-2015 (78.2% of cases), especially in 2014. The overall malignancy rate was 17.5%, which was significantly higher in men (58.8%) than in women (44.1%) and increased sharply with age. Pathologically, adenocarcinoma was the most common type of malignancy (85.9%), and the rectum was the most common site of involvement (31.8%).

Conclusion:
Based on the findings of this study, colorectal cancers were observed mainly in men and the elderly, with adenocarcinoma being the most common pathological type and the rectum being the most common site of involvement.

Keywords: Histological features, Neoplasm, Colorectal, Excisional

please cite this paper as:
Naseri L, Rizehbandi M, Hafezi Ahmadi MR, Dolatyari P. The Incidence and Pathological Characteristics of Colorectal Neoplasms in Excisional Biopsy Specimens Performed at Imam Khomeini Hospital during 2011-2023. *Govaresh*. 2026;31: 76-89.

**Corresponding Author:*
Leila Naseri, PhD in Department of Anatomy.
Address : Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran.
Tel: + 98 9101971151
Email: naseri-l@medilam.ac.ir

Received: 28 Feb. 2026
Revised: 17 May 2026
Accepted: 18 May 2026

INTRODUCTION

Gastrointestinal (GI) cancers, including cancers of the esophagus, stomach, colorectum, liver, and pancreas, represent a major global health burden and account for a substantial proportion of cancer-related morbidity and mortality. Among these malignancies, colorectal cancer (CRC) is one of the most frequently diagnosed cancers worldwide and remains a leading cause of cancer-related death. Despite significant advances in screening, diagnosis, and treatment, the global burden of CRC continues to increase. In 2018, these tumors collectively accounted for 26.3% of cancer cases and 35.4% of cancer deaths worldwide (1). The most common gastrointestinal cancer is CRC, which alone accounts for 38.8% of gastrointestinal cancer cases and 26.0% of gastrointestinal cancer-related deaths (2-4). The epidemiological distribution of gastrointestinal cancers varies considerably across different geographic regions and levels of socioeconomic development. While esophageal, gastric, and liver cancers are more prevalent in many Asian countries, CRC is more common in developed regions such as Europe and North America. These geographic differences reflect multiple factors, including dietary habits, obesity, physical inactivity, smoking, alcohol consumption, environmental exposures, genetic susceptibility, and access to healthcare services.In Iran, the incidence of CRC has shown a steady increase over recent decades. Population aging, urbanization, westernization of lifestyle, and improvements in cancer registration systems have all contributed to the growing number of reported cases. CRC is currently among the most common malignancies in both Iranian men and women, highlighting the need for continuous epidemiological surveillance and regional investigations to better understand disease patterns and optimize preventive strategies. Recent national data from the Iranian National Population-based Cancer Registry showed an age-standardized incidence rate of 134.45 per 100,000 in men and 94.85 per 100,000 in women during 2014–2017, with Ilam province among the regions with the highest rates (5). Most CRCs develop through a multistep process involving the gradual accumulation of genetic and epigenetic alterations. Histopathological examination remains the gold standard for diagnosing and classifying colorectal neoplasms. Adenocarcinoma is the predominant histological subtype and accounts for most of colorectal malignancies. Tumor location, histological subtype, and degree of differentiation are important clinicopathological characteristics that influence prognosis, treatment selection, and patient outcomes (6-8). More than 90% of colorectal carcinomas are adenocarcinomas, which originate from the epithelial cells of the colorectal mucosa (9). Other rare types of colorectal carcinomas include neuroendocrine, squamous cell, adenosquamous, spindle cell, and undifferentiated carcinomas. Typical adenocarcinoma is characterized by gland formation, which forms the basis for histological grading. In well-differentiated adenocarcinoma, more than 95% of the tumor is gland-forming.

Moderately differentiated adenocarcinoma shows 50–95% gland formation. Poorly differentiated adenocarcinoma is predominantly solid with <50% gland formation. In practice, most of colorectal adenocarcinomas (~70%) are diagnosed as moderately differentiated. Well-differentiated carcinoma and poorly differentiated carcinoma account for 10% and 20%, respectively. Tumor grade is determined by careful clinical and pathological evaluation. Many studies have shown that a 2-tier grading system, which combines well- and moderately differentiated as low grade (50% gland formation) and poorly differentiated as high grade (>50% gland formation), reduces interobserver variability and improves prognostic significance (10-11).

Although controversial, tumor grade is generally considered a prognostic variable independent of stage, and high-grade or poorly differentiated histology is associated with poor patient survival (12). However, it should be emphasized that histological grading should only be applied to typical adenocarcinomas. Some histological types may exhibit high-grade morphology but behave like low-grade tumors because of their Microsatellite Instability Test (MSI) status (13). Recently, a study that examined the pattern and trend of CRCs in young adults in 36 countries found that CRC death rates were rapidly increasing in 19 of the 36 countries studied, while rates were decreasing in three countries (13). Since differences in the incidence of gastrointestinal cancers have been linked to genetic and environmental factors, especially dietary patterns and lifestyle, and a combination of factors such as obesity along with tobacco and alcohol use (14-16), understanding these trends can help develop effective programs to reduce and control their incidence. The study by Fattahi et al. states that stomach cancer in Iran has undergone a downward trend from 1990 to 2017 (17). However, despite studies conducted in this field, there is no accurate information on the trend of CRC in Iran, which accounts for the largest share of deaths from gastrointestinal cancers in the world (18-19). Therefore, this study aimed to clarify this issue b

y investigating the incidence and histological characteristics of colorectal neoplasms in excisional biopsy specimens in Ilam province from 2011 to 2023.

MATERIALS AND METHODS

This study was conducted as a descriptive-analytical epidemiological study. We extracted the required histological data from histological reports of colorectal specimens obtained from excisional biopsies performed at Imam Khomeini Hospital and referred to this center's laboratory during the years 2011 to 2023. We also extracted epidemiological data related to the samples,

including age and sex, from hospital records.In this study, we used a census method to collect observations. For this purpose, we collected all necessary demographic information from excisional biopsies taken between 2011 and 2023 at Imam Khomeini Hospital. We prepared a questionnaire on demographic characteristics (age, sex, year) and pathology information for the samples, including colorectal excisional biopsies, pathology type, anatomical location, and malignant lesions, and collected the data. Patients who underwent surgery at Imam Hospital had part of the intestine removed, and the samples were sent to the hospital's pathology center for pathological examination.In the period 2012 to 2017, the total number of clinical samples accepted at Imam Khomeini Hospital was 17,340 samples, but due to the oldness of the data, it was not possible to separate cases related to the colorectal system intelligently or systematically; therefore, the data were separated and collected manually, and the cases related to the colorectal system were 597 samples. From 2018 to 2023, part of the data was collected systematically and part manually, including 264 samples. The reason for the decrease in the number of samples in the second 6 years was the non-acceptance of samples sent from other hospitals in the province and private practices since 2018, which before that, these samples were accepted at Imam Khomeini Hospital. A total of 861 samples were collected, of which the following were excluded from the study:

1. Colon samples sent following appendectomy that did not have evidence of malignancy in the pathology report.
2. Colon samples sent following volvulus or intestinal obstruction that did not have evidence of malignancy in the pathology report.
3. Rectal samples sent following rectal prolapse surgery that did not have evidence of malignancy in the pathology report.
4. Complete or partial colorectal resection samples in multiple trauma patients that did not have evidence of malignancy in the pathology report.
5. Pathology reports with incomplete information.6. Samples from patients with intersex names whose gender was not mentioned (only two cases).

Finally, 487 samples were included for analysis and review: 229 from female patients and 258 from male patients.

We used descriptive and analytical statistics, including parametric tests of variance analysis and nonparametric tests, as well as regression analysis, to analyze the data at a significance level of 5%. All statistical tests were performed using SPSS software version 24. We also collected histological information from the histological reports of colorectal samples obtained from biopsies of these patients in a separate checklist.

RESULTS

The results show that the oldest age group (60 years and older) had the highest share, at 33.1% (161 people). The middle-aged groups 30-39 years: 18.3% (89 people), 40-49 years: 17% (83 people), 50-59 years: 14.8% (72 people) and the youngest group (less than 30 years: 16.8% (82 people) have the lowest frequency. The study population is skewed toward the 60+ age group. Men make up the majority of the sample, at 53% (258 people). Women are in the minority with 47% (229 people), with a slight male preponderance (ratio 1.13 to 1). The peak of sampling was in 2016 with 26.1% (127 people). The active study period was 2013- 2017, with 78.2% of the total sample (381 people), a significant decrease from 2018 onwards, with only 13.8% (67 people), and the most recent data from 2023 only include 1.6% (8 people) of the sample (Table 1).

Table 1. Frequency distribution of age, sex, and years studied

Percentage	Abundance	Variable
		Age (years)
16.8	82	30>
18.3	89	30-39
17	83	40-49
14.8	72	50-59
33.1	161	60<
		Sex
47	229	Female
53	258	Male
		Years (Editor: Correct the dates in English)
3.3	16	2011
4.7	23	2012
11.3	55	2013
13.3	65	2014
16.4	80	2015
26.1	127	2016
12.1	59	2017
3.1	15	2018
2.3	11	2019
2.1	10	2020
1.6	8	2021
2.1	10	2022
1.6	8	2023

In terms of the distribution of the number of biopsies,

the most common condition was a single biopsy with 40.7% (198 patients), followed by two (25.1%; 122 patients), three (16.6%; 81 patients), four to six (12.1%; 59 patients), and more than six (5.5%; 27 patients). Overall, most patients (82.4%) underwent up to three biopsies. Regarding malignancy status, most patients (82.5%; 402 patients) had no malignant lesions. Among patients with malignant lesions, 8.6% (42 patients) had one lesion, 2.7% (13 patients) had two lesions, and 6.2% (30 patients) had three or more malignant lesions. The overall incidence rate of malignancy was calculated to be 17.5% (85 patients, Table 2).

Table 2. Determination of the number of colorectal biopsies and excisional malignancies

Percentage	Abundance	Variable
		Biopsy
40.7	198	1
25.1	122	2
16.6	81	3
12.1	59	4-6
5.5	27	6<
		Malignant lesions Non-malignant
82.5	402	1
8.6	42	2
2.7	13	3<
6.2	30	
		Incidence of malignancy
17.5	85	Yes
82.5	402	No

The results show that the years with the highest activity were 2013 to 2017 (78.2% of total biopsies), with a peak in 2016 (127 biopsies and a noticeable decrease from 2018 onwards, with a significant decrease in the number of biopsies reported. The distribution pattern of the number of biopsies in different years: the first period (2011-2012) limited number of biopsies (16 and 23 cases), the most dominant pattern of one to three biopsies per year and the peak period (2013-2017) a significant increase in the number of biopsies and in 2016, 61 single biopsies (the highest number) variation in the pattern of multiple biopsies and the period of decline 2018-2023, a sharp decrease in the total number of biopsies and a change in the pattern towards multiple biopsies (more than six cases) in recent years (Table 3).

Table 3. Determining the number of colorectal excisional biopsies per year

Variable	1	2	3	4-6	6<
2011	2	5	5	4	0
2012	2	4	7	10	0
2013	22	5	14	12	2
2014	26	25	8	6	0
2015	43	19	12	6	0
2016	61	28	24	13	1
2017	26	25	6	2	0
2018	4	4	2	0	5
2019	6	4	1	0	0
2020	3	3	1	0	3
2021	1	0	0	1	6
2022	0	0	0	5	5
2023	2	0	1	0	5

The results indicate that men had the highest number of biopsies in 2016 (67 cases) and 2015 (44 cases), and women had the highest number of biopsies in 2016 (60 cases) and 2015 (36 cases). In the peak period, men had 156 biopsies (56.9%), and women had 118 biopsies (43.1%); in the recent period (2017-2018), women predominated, with 10 biopsies (58.8%), and men had seven biopsies (41.2%). Single biopsies (1) were most common in men in 2016 (33 cases) and in women (28 cases); multiple biopsies (<6) and a relative increase in women were observed in recent years (Table 4).

Table 4. Determining the number of colorectal excisional biopsies per year by sex

Variable		1	2	3	6-4	6<
2011	Female	2	2	1	0	0
	Male	0	3	4	4	0
2012	Female	1	1	2	5	0
	Male	1	3	5	5	0
2013	Female	10	2	3	5	1
	Male	12	3	11	7	1
2014	Female	11	12	5	3	0
	Male	15	13	3	3	0
2015	Female	20	8	5	3	0
	Male	23	11	7	3	0
2016	Female	28	13	13	5	1
	Male	33	15	11	8	0

Table 4. Determining the number of colorectal excisional biopsies per year by sex

Variable		1	2	3	6-4	6<
2017	Female	11	11	5	0	0
	Male	15	14	1	2	0
2018	Female	3	4	2	0	4
	Male	1	0	0	0	1
2019	Female	4	0	0	0	0
	Male	2	4	1	0	0
2020	Female	3	2	1	0	2
	Male	0	1	0	0	1
2021	Female	0	0	0	0	3
	Male	1	0	0	1	3
2022	Female	0	0	0	4	2
	Male	0	0	0	1	3
2023	Female	2	0	1	0	3
	Male	0	0	0	0	2

The results show the highest sampling in 2017-2018 (83.6%), with a peak in 2016 (127 cases) and a decrease from 2018 onward. Malignant lesions in 2015-2019 had a low incidence of malignancy (6.3% in 2011, 17.4% in 2012) and were mainly non-malignant or single-lesion cases, and the highest number of non-malignant samples in 2016, the highest diversity (five single-lesion cases, four two-lesion cases, three three-lesion or more cases), and during 2017-2020, there was a sharp decrease in the number of samples and a relative increase in the percentage of malignancy. In recent years (2017-2018), the percentage of malignancy has increased significantly (2017: 87.5% of malignant cases, 2018: 70% of malignant cases, and 2019: 87.5% of malignant cases) (Table 5, Figure 1).

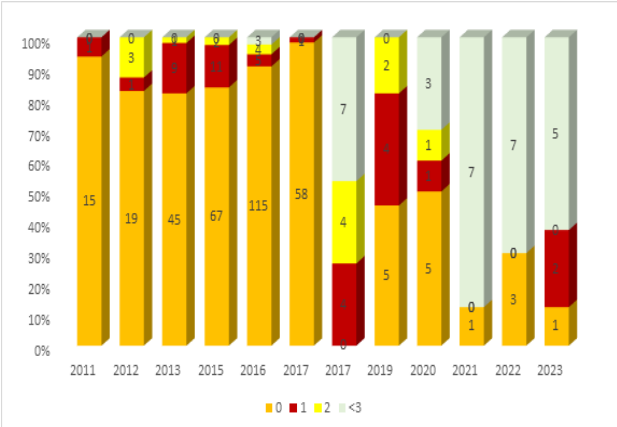


Figure 1. Number of malignant lesions in colorectal excisional biopsies per year .

Table 5. Determining the number of malignant lesions in colorectal excisional biopsies per year

Variable	0	1	2	3<
2011	15	1	0	0
2012	19	1	3	0
2013	45	9	1	0
2014	56	8	1	0
2015	67	11	2	0
2016	115	5	4	3
2017	58	1	0	0
2018	0	4	4	7
2019	5	4	2	0
2020	5	1	1	3
2021	1	0	0	7
2022	3	0	0	7
2023	1	2	0	5

The overall trend of malignancy incidence by sex shows that men had the highest number of samples in 2016 (67 cases) and 2015 (44 cases) and women had the highest number of samples in 2016 (60 cases) and 2015 (36 cases). The sex pattern of malignant lesions in the peak period (2013-2017) was 85.1% of men without malignancy and 81.2% of women without malignancy, with the incidence of malignancy being similar in the two sexes. In the recent period (2021-2023), a change in the pattern towards more advanced cases and a significant increase in multiple malignant lesions (three or more) was observed, and 100% of women had malignancy in 2021 and 100% of men had malignancy in 2021. The pattern of single malignant lesions was highest in men in 2013 (six cases) and highest in women in 2015 (eight cases). The pattern of multiple malignant lesions (<3) showed a similar increase in both sexes in recent years, as reported in 2013 (three cases in women, two cases in men) and in 2014 (four cases in women, three cases in men) (Table 6).

Table 6. Determination of the number of malignant lesions in colorectal excisional biopsies per year by sex

Variable		0	1	2	3<
2011	Female	4	1	0	0
	Male	11	0	0	0
2012	Female	7	1	1	0
	Male	12	0	2	0
2013	Female	18	3	0	0
	Male	27	6	1	0

Table 6. Determination of the number of malignant lesions in colorectal excisional biopsies per year by sex

Variable		0	1	2	3<
2014	Female	26	5	0	0
	Male	30	3	1	0
2015	Female	27	8	1	0
	Male	40	3	1	0
2016	Female	56	2	1	1
	Male	59	3	3	2
2017	Female	26	1	0	0
	Male	32	0	0	0
2018	Female	3	4	6	0
	Male	1	0	1	0
2019	Female	1	3	0	0
	Male	4	1	2	0
2020	Female	4	1	1	2
	Male	1	0	0	1
2021	Female	0	0	0	3
	Male	1	0	0	4
2022	Female	2	0	0	4
	Male	1	0	0	3
2023	Female	1	2	0	3
	Male	0	0	0	2

The results show that the overall distribution of pathology types was 92.4% benign lesions (450 out of 487) and 17.5% malignant lesions (85 out of 487), with completely benign lesions being 102 cases (100% non-malignant), 208 cases (100% non-malignant), 19 cases (100% non-malignant), 27 cases (100% non-malignant), 44 cases of precancerous polyps (40 cases non-malignant, four cases with malignancy), 73 cases of adenocarcinoma (one case non-malignant, 72 cases with malignancy), 10 cases of mucinous carcinoma (one case non-malignant, nine cases with malignancy), and one case of rare malignant types of neuroendocarcinoma (malignant), small round cell tumor one case (malignant), mesenchymal carcinoma one case (malignant) and lymphoproliferative tumor one case (malignant). Adenocarcinoma 49.3% of cases had more than one malignant lesion and mucinous carcinoma 40% of cases had more than one malignant lesion and the most common type of malignancy was adenocarcinoma: 85.9% of all malignant cases mucinous carcinoma 10.6% of all malignant cases were reported (Table 7, Figure 2).

Table 7. Determination of the number of malignant lesions in colorectal excisional biopsies by pathology type

Pathology	Non-malignant	1	2	3<
No significant pathologic changes	102	0	0	0
Inflammatory pathologies	208	0	0	0
Ulcerative lesions	19	0	0	0
Benign polyp	27	0	0	0
Precancerous polyp	40	2	2	0
Adenocarcinoma	1	36	13	23
Mucinous carcinoma	1	5	0	4
Neuroendocarcinoma	0	0	0	1
Small round cell tumor	0	0	0	1
Mesenchymal carcinoma	0	0	0	1
Lymphoproliferative tumor	0	1	0	0

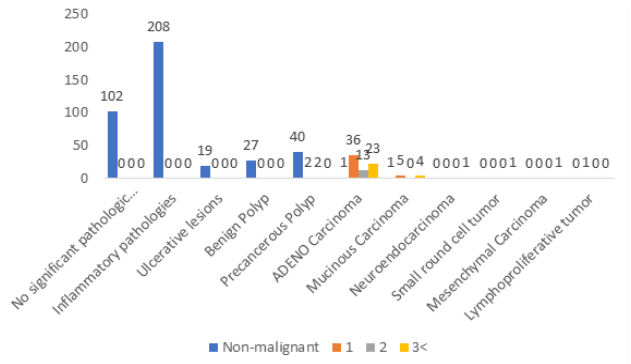


Figure 2. Number of malignant lesions in colorectal excisional biopsies by pathology type.

The overall distribution of lesions based on anatomical location was as follows: Rectum 155 cases (31.8% of all cases), with the highest frequency being colon 116 cases (23.8% of all cases), cecum 31 cases (6.4% of all cases), and the incidence of malignancy in different locations was cecum 35.5% of cases with malignancy (11 of 31), hepatic flexure colon 50% of cases with malignancy (two of four), and sigmoid 29.8% of cases with malignancy (20 of 67). The areas with the lowest proportion of malignancy included transverse colon 5.3% of cases with malignancy (one of 19) and splenic flexure 27.3% of cases with malignancy (three of 11). The areas with the highest multifocal cases

included rectum 10 cases with more than one malignant lesion, sigmoid 10 cases with more than one malignant lesion, and cecum six cases with more than one malignant lesion. The highest concentration of lesions was in rectum and sigmoid (Table 8, Figure 3).

Table 8. Determining the number of malignant lesions in colorectal excisional biopsies by anatomical location.

Anatomical location	Non-malignant	1	2	3<
Cecum	20	5	1	5
Colon	103	8	1	4
Ascending colon	19	3	1	4
Hepatic flexure	2	2	0	0
Transverse colon	18	0	1	0
Splenic flexure	8	2	1	0
Descending colon	18	3	3	3
Sigmoid	47	10	5	5
Rctosigmoid	21	3	1	5
Rectum	134	11	4	6

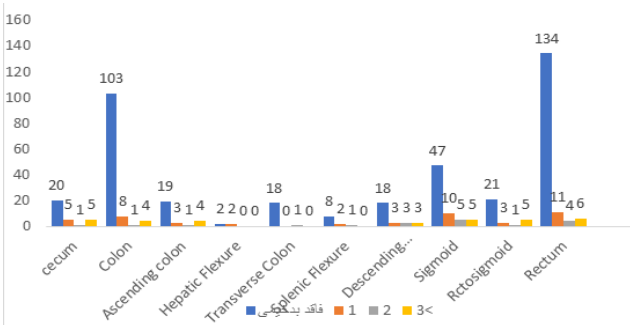


Figure 3. Number of malignant lesions in colorectal excisional biopsies by anatomical site.

Table 9. Anatomical location of colorectal excisional biopsies in each sex.

Anatomical location	Sex	
	Female	Male
Cecum	13	18
Colon	55	61
Ascending colon	11	16
Hepatic flexure	1	3
Transverse colon	8	11
Splenic flexure	5	6
Descending colon	15	12
Sigmoid	28	39
Rctosigmoid	14	16
Rectum	79	76

The results show that the overall distribution based on sex was 229 women (47% of total cases) and 258 men (53% of total cases), and the lesions in both sexes were reported with the highest frequency in women including rectum 79 cases (34.5% of female cases), colon 55 cases (24% of female cases) and sigmoid 28 cases (12.2% of female cases) and the highest frequency in men including rectum 76 cases (29.5% of male cases), colon 61 cases (23.6% of male cases) and sigmoid 39 cases (15.1% of male cases). Higher incidence in women was reported as descending colon 15 cases in women versus 12 cases in men and rectosigmoid 14 cases in women versus 16 cases in men and higher incidence in men, including cecum 18 cases in men versus 13 cases in women, descending colon 16 cases in men versus 11 cases in women and sigmoid 39 cases in men versus 28 cases in women.

In both sexes, the rectum is the most common site of involvement, and the order of site prevalence is similar in both sexes. Men tend to have more involvement in the proximal areas (cecum and descending colon), and women tend to have more involvement in the distal areas (descending colon).

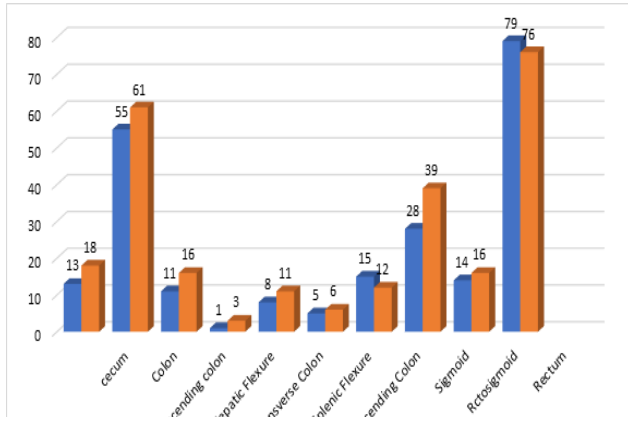


Figure 4. Anatomical location of colorectal excisional biopsies in each sex.

Overall trend in malignancy incidence in the period 2011-2017: relatively low incidence of malignancy (6.3% to 16.2%), with peaks in 2015 (16.2%) and 2013 (18.2%), period 2018-2023: significant increase in malignancy incidence to an average of 70-80%, with peaks in 2021 (87.5%) and 2023 (87.5%). The total number of biopsies decreased sharply from 2018 onwards (from 59 cases in 2017 to 8 cases in 2023). Malignant cases increased from 2018 onwards (Table 10, Figure 5).

Table 10. Determining the incidence of malignant lesions in colorectal excisional biopsies per year.

years	Occurrence of malignant lesions	
	Yes	No
2011	1	15
2012	4	19
2013	10	45
2014	9	56
2015	13	67
2016	12	115
2017	1	58
2018	15	0
2019	6	5
2020	5	5
2021	7	1
2022	7	3
2023	7	1

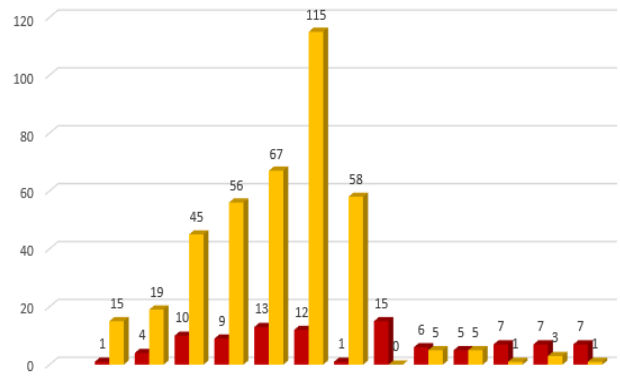


Figure 5. Incidence of malignant lesions in colorectal excisional biopsies per year (Editor: Correct the dates in English).

The results show that in men, there were 97 total biopsies and 57 malignant cases, with a malignancy incidence rate of 58.8%; in women, there were 390 total biopsies, 172 malignant cases, and a malignancy incidence rate of 44.1%. The malignancy incidence rate in men was significantly higher by 14.7% than in women (Table 11, Figure 6).

Table 11. Determination of the incidence of malignant lesions in colorectal excisional biopsies by sex

Sex	Occurrence of malignant lesions	
	Yes	No
Male	39	219
Female	46	183

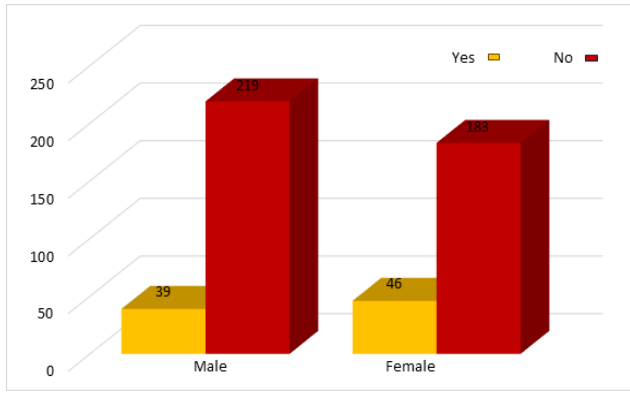


Figure 6. Incidence of malignant lesions in colorectal excisional biopsies by sex.

The results indicate the lowest incidence in the 30-39 age group (3.4%), with a gradual increase from age 40 onwards and a steep rise in the 60+ age group (36.6%). There is a 10-fold increase in the incidence of malignancy from the younger age group (30-39 years) to the elderly group (60+ years), and about 70% of all malignant cases are concentrated in the age group 60 years and above, and the increase in incidence begins from the fourth decade of life onwards (Table12, Figure 7).

Table12. Determination of the incidence of malignant lesions in colorectal excisional biopsies at each age.

Age	Occurrence of malignant lesions	
	Yes	No
30>	4	78
39-30	3	86
49-40	15	68
59-50	16	56
60<	59	102

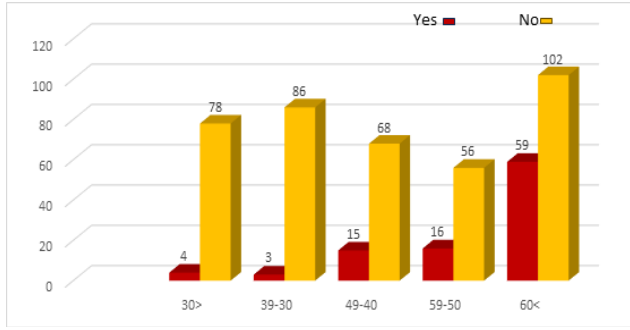


Figure 7. Determining the incidence of malignant lesions in colorectal excisional biopsies at each age.

The highest incidence of malignancy was reported in the hepatic flexure (50%, two out of four), cecum (35.5%, 11 out of 31), descending colon (33.3%, nine out of 27), and the lowest incidence of malignancy was reported in the transverse colon (5.3%, one out of 19), colon (11.2%, 13 out of 116), and rectum (13.5%, 21 out of 155). Proximal regions (cecum, descending colon, hepatic flexure) had the highest rate of malignancy, while distal regions (rectum and sigmoid) had the lowest rate of malignancy despite the higher incidence of cases. The transverse colon showed the lowest risk of malignancy among all regions (Table 13, Figure 8).

Table 13. Determination of the incidence of malignant lesions in colorectal excisional biopsies by anatomical site.

Anatomical location	Occurrence of malignant lesions	
	Yes	No
Cecum	11	20
Colon	13	103
Ascending colon	8	19
Hepatic flexure	2	2
Transverse colon	1	18
Splenic flexure	3	8
Descending colon	9	18
Sigmoid	20	47
Rctosigmoid	9	21
Rectum	21	134

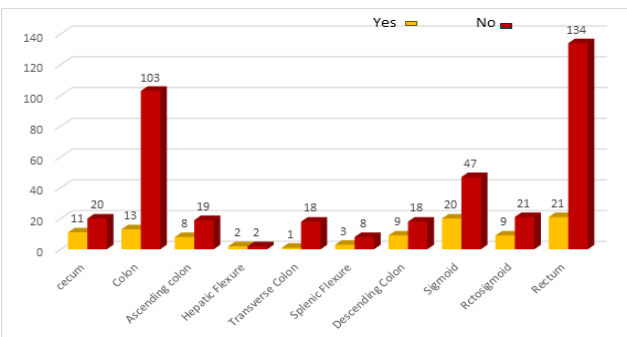


Figure 8. Incidence of malignant lesions in colorectal excisional biopsies by anatomical site.

The results show that benign pathologies were relatively uniformly distributed across all age groups.
Inflammatory pathologies decreased relative to other groups in the 50-59 age group (17 cases). Premalignant polyps increased progressively with age (from 1 case in young people to 24 cases in the elderly). Adenocarcinoma showed a significant increase with age (from 0 cases under 30 years to 46 cases in 60 years and older). Adenocarcinoma showed a significant onset from the fourth decade of life. The peak incidence was in the 60-year-and-older age group (55 cases of adenocarcinoma), and rare types of malignancy were observed in specific age groups (Table 14, Figure 9).

Table 14. Pathological description of excisional biopsies by age.

Pathology	Age				
	30>	39-30	49-40	59-50	60<
No significant pathologic changes	21	25	19	16	21
Inflammatory pathologies	53	49	39	17	50
Ulcerative lesions	5	2	4	5	3
Benign polyp	1	5	4	10	7
Precancerous polyp	1	5	3	11	24
Adenocarcinoma	0	3	12	12	46
Mucinous carcinoma	0	0	1	1	8
Neuroendocarcinoma	0	0	0	0	1
Small round cell tumor	1	0	0	0	0
Mesenchymal carcinoma	0	0	1	0	0
Lymphoproliferative tumor	0	0	0	0	1

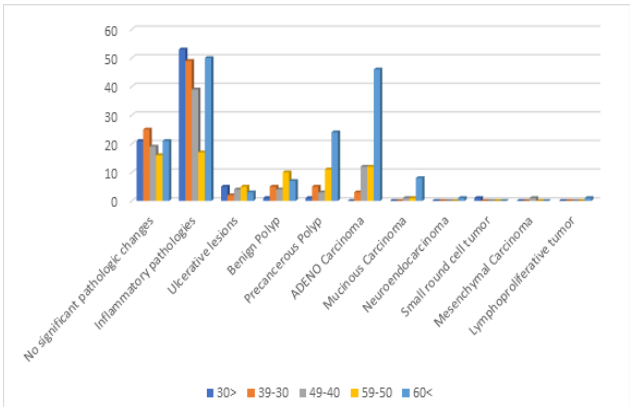


Figure 9. Pathological description of excisional biopsies by age.

Benign pathologies included inflammatory pathologies in men (111 cases) more than women (97 cases) and pathological changes in men (58 cases) more than women (44 cases), and premalignant and malignant lesions included premalignant polyps in men (25 cases) more than women (19 cases), adenocarcinoma in women (42 cases) more than men (31 cases), and mucinous carcinoma in men (eight cases) more than women (two cases). The female-to-male ratio in adenocarcinoma was 1.35 to 1, and the male-to-female ratio in mucinous carcinoma was 4 to 1, and there was a relatively balanced distribution in premalignant polyps (1.3 to 1 in favor of men) (Table 15, Figure 10).

Table 15. Pathological description of excisional biopsies by sex

Pathology	Sex	
	Female	Male
No significant pathologic changes	44	58
Inflammatory pathologies	97	111
Ulcerative lesions	11	8
Benign polyp	12	15
Precancerous polyp	19	25
Adenocarcinoma	42	31
Mucinous carcinoma	2	8
Neuroendocarcinoma	1	0
Small round cell tumor	0	1
Mesenchymal carcinoma	0	1
Lymphoproliferative tumor	1	0

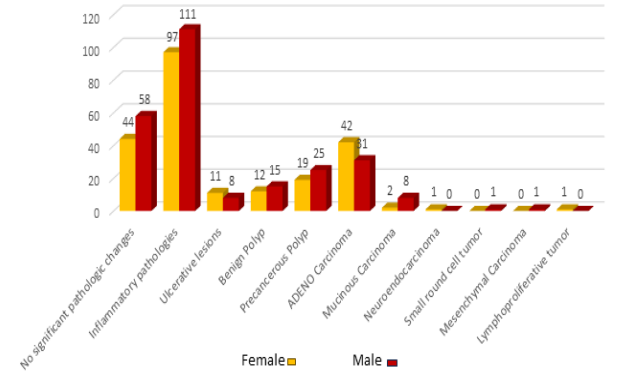


Figure 10. Pathological description of excisional biopsies by sex.

The overall trend of malignancy incidence by age and year, 2011-2017 period: Concentration of malignancy cases in the age group of 60 years and above, absence of malignancy cases in the age groups under 40 years and gradual incidence in the age groups of 49-40 years and 59-50 years, 2018-2019 period: A change in the pattern has been observed with the emergence of malignancy cases in the age group under 30 years and the spread of malignancy incidence to all age groups and the continued dominance of the age group of 60 years and above. The age group of 60+ years has the highest share in all years (total 55 cases), the age group of 49-40 years: 15 cases in the entire period, the age group of 59-50 years: 16 cases in the entire period, and younger age groups have reported a low but increasing incidence in recent years (Table 16).

Table 16. Determining the relationship between age and the incidence of malignant lesions per year

Year / Incidence of malignant lesions	Age					p
	30>	39-30	49-40	59-50	60<	
2011	0	0	0	0	1	0.001>
2012	0	0	1	1	2	
2013	0	0	1	2	7	
2014	0	0	3	3	3	
2015	0	1	1	2	9	
2016	0	0	2	0	10	
2017	0	0	0	1	0	
2018	3	1	0	3	8	
2019	0	1	2	0	3	
2020	0	0	1	0	4	
2021	1	0	2	1	3	
2022	0	0	2	2	3	
2023	0	0	0	1	6	

DISCUSSION

This study provides valuable local data regarding the epidemiological and pathological characteristics of colorectal neoplasms in Ilam province. The predominance of disease among older adults, the higher frequency among males, and the predominance of adenocarcinoma emphasize the importance of continued surveillance, early detection strategies, and improved CRC screening programs. The findings should be interpreted in light of several limitations. The study was conducted at a single referral hospital, and changes in referral patterns, biopsy practices, and the availability of pathology services during the study period may have influenced the observed temporal trends. In addition, because this study was based on pathology

specimens, it may not represent the true population incidence of colorectal neoplasms. A key finding was the association between malignancy and increasing age. Malignant lesions were considerably more common among individuals aged ≥60 years, while younger age groups showed substantially lower frequencies. These results support current recommendations for age-based CRC screening and emphasize the need for awareness of early-onset colorectal cancer, which has become an emerging concern worldwide (20-21). The rectum was the most frequent anatomical site of involvement in our study, followed by the colon and sigmoid region. Previous studies have described similar distributions, although differences between populations may occur because of genetic, environmental, and screening-related factors (22-26). The relatively frequent involvement of distal colorectal segments supports the importance of complete colon evaluation, particularly in patients with malignant lesions, because synchronous lesions may occur. Histopathologically, adenocarcinoma was the dominant malignant subtype, accounting for 85.9% of malignant cases, followed by mucinous carcinoma. This finding agrees with previous studies indicating that conventional adenocarcinoma represents the vast majority of colorectal malignancies (27-28). Rare histological types, including neuroendocrine carcinoma, mesenchymal tumors, and lymphoproliferative tumors, were identified only sporadically, which is consistent with their low prevalence reported in the literature (29-36). The overall malignancy rate in the present study was 17.5%. Although most evaluated specimens showed non-malignant lesions, malignant cases demonstrated clinically important patterns, including multifocal involvement. Previous studies have reported variable malignancy rates among colorectal lesions depending on the study population, diagnostic method, and selection criteria (37-39). The observed frequency of malignant lesions in our study highlights the importance of careful pathological evaluation and appropriate follow-up of colorectal lesions. In our population, males constituted a slightly higher proportion of cases than females (53% vs. 47%). This male predominance is consistent with global epidemiological data showing a higher incidence of CRC among men than women (40-43). Biological differences, including hormonal effects, lifestyle-related risk factors, and differences in exposure to carcinogenic factors, may contribute to this sex disparity. Previous studies have also reported sex-specific differences in colorectal cancer subsite distribution, with women showing a higher risk of proximal colon cancer, although our data showed a predominance of distal involvement in both sexes (44).

The present study demonstrated that colorectal lesions were more frequently observed among older individuals, with the highest proportion of cases occurring in patients aged ≥60 years. This finding is consistent with previous reports showing that CRC is predominantly a disease of older adults, although an increasing incidence among younger populations has been reported in recent decades (45-52). The predominance of older patients in our study may reflect the cumulative effect of genetic alterations, prolonged exposure to environmental risk factors, and age-related changes in colorectal mucosa. CRC is one of the most prevalent malignancies worldwide and represents an important public health challenge. The epidemiological profile and pathological characteristics of CRC vary among populations because of differences in genetic background, lifestyle, environmental exposures, and access to screening programs. In Iran, as in many countries, colorectal neoplasms have shown changing patterns in incidence and age distribution, underscoring the importance of population-based studies. This study evaluated the demographic characteristics, temporal trends, and histopathological features of colorectal neoplasms diagnosed in excisional biopsy specimens at Imam Khomeini Hospital over a 13-year period.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to this work.

REFERENCES:

1. Hamilton SR, Aaltonen LA, editors. Pathology and genetics of tumours of the digestive system. Lyon: IARC Press; 2000.
2. Compton CC. Updated protocol for the examination of specimens from patients with carcinomas of the colon and rectum, excluding carcinoid tumors, lymphomas, sarcomas, and tumors of the vermiform appendix: a basis for checklists. *Arch Pathol Lab Med*. 2000;124(7):1016-25.
3. Compton CC, Fielding LP, Burgart LJ, Conley B, Cooper HS, Hamilton SR, et al. Prognostic factors in colorectal cancer: College of American Pathologists consensus statement 1999. *Arch Pathol Lab Med*. 2000;124(7):979-94.
4. Fleming M, Ravula S, Tatishchev SF, Wang HL. Colorectal carcinoma: pathologic aspects. *J Gastrointest Oncol*. 2012;3(3):153-73.
5. AziziKia H, Teymourzadeh A, Kouchaki H, Nakhos-

tin-Ansari A, Jafari Doudaran P, Ahmadinejad I, et al. Colorectal Cancer Incidence in Iran Based on Sex, Age, and Geographical Regions: A Study of 2014-2017 and Projected Rates to 2025. *Arch Iran Med*. 2024;27(4):174-182.
6. Blenkinsopp WK, Stewart-Brown S, Blesovsky L, Kearney G, Fielding LP. Histopathology reporting in large bowel cancer. *J Clin Pathol*. 1981;34(5):509-13.
7. Kumar A, Dhungana SB, Gupta RK, Sah SP, Khanal B. Clinico-pathological characteristics of obstructing colorectal cancer and its management outcomes at a tertiary referral center of Eastern Nepal. *BMC Gastroenterol*. 2022;22(1):303.
8. Khan S, Haider G, Abid Z, Bukhari N, Khan SZ, Abid M. Adequacy of surgical pathology reports of colorectal carcinoma and its significance. *Cureus*. 2021;13(8):e17107.
9. Soong TR, Naylor J, Stachler MD, Perencevich M, Jajoo K, Saltzman JR, et al. Clinicopathologic and genetic characteristics of interval colorectal carcinomas favor origin from missed or incompletely excised precursors. *Mod Pathol*. 2019;32(5):666-74.
10. Hu Z, Li Y, Mao W, Chen B, Yang L, Meng X. Impact of nutritional indices on the survival outcomes of patients with colorectal cancer. *Cancer Manag Res*. 2020;12:2279-89.
11. Hoydahl Ø, Edna TH, Xanthoulis A, Lydersen S, Endreseth BH. Long-term trends in colorectal cancer: incidence, localization, and presentation. *BMC Cancer*. 2020;20(1):1077.
12. Shalata W, Gluzman A, Man S, Cohen AY, Abu Jama A, Gothelf I, et al. Colorectal cancer in elderly patients: insights into presentations, prognosis, and patient outcomes. *Medicina (Kaunas)*. 2024;60(12):1951.
13. Montgomery A, Vadapalli R, Dinenno FA, Schilling J, Jain P, Jacob A, et al. Machine learning to evaluate the effects of non-clinical social determinant features in predicting colorectal cancer mortality in a medically underserved Appalachian population. *Sci Rep*. 2025;15(1):25781.
14. Copija A, Glogowski L, Janion K, Nowakowska-Zajdel E. Variability of clinical characteristic of colorectal cancer patients-analysis of selected parameters. *OncoReview*. 2018;8(3):80-5.
15. Mello MRSP, Moura SF, Muzi CD, Guimaraes RM. Clinical evaluation and pattern of symptoms in colorectal cancer patients. *Arq Gastroenterol*. 2020;57(2):131-6.
16. Tait C, Patel AH, Chen A, Li Y, Minacapelli CD, Rustgi V. Early-onset colorectal cancer: prevalence, risk factors, and clinical features among commercially insured adults in the United States. *Cureus*. 2023;15(11):e48957.
17. Fattahi N, Moghaddam SS, Rezaei N, Rezaei N, Fattahi E, Moradveisi B, et al. The national trend of the gastric cancer burden in Iran from 1990 to 2017. *Asia Pac J Clin Oncol*. 2022;18(2):e96-e102.
18. Sawaid IO, Samson AO, Al-Ramahi R. Evaluation of stages, treatment protocols, and outcomes of colorectal cancer among West Bank patients. *J Clin Med*. 2024;13(8):2284.
19. Xi Y, Xu P. Global colorectal cancer burden in 2020 and projections to 2040. *Transl Oncol*. 2021;14(10):101174.
20. Darmadi D, Mohammadian-Hafshejani A, Kheiri S. Global disparities in colorectal cancer: unveiling the present landscape of incidence and mortality rates, analyzing geographical variances, and assessing the human development index. *J Prev Med Hyg*. 2025;65(4):E499-508.
21. Harvey BJ, Harvey HM. Sex differences in colon cancer: genomic and nongenomic signalling of oestrogen. *Genes (Basel)*. 2023;14(12):2225.
22. Tsokkou S, Konstantinidis I, Papakonstantinou M, Chatzikomnitsa P, Liampou E, Toutziari E, et al. Sex differences in colorectal cancer: epidemiology, risk factors, and clinical outcomes. *J Clin Med*. 2025;14(15):5539.
23. Cazacu SM, Saftoiu A, Iordache S, Ghilusi MC, Georgescu CV, Iovanescu VF, et al. Factors predicting occurrence and therapeutic choice in malignant colorectal polyps: a study of 13 years of colonoscopic polypectomy. *Rom J Morphol Embryol*. 2022;62(4):917-28.
24. Santos CEO, Malaman D, Carvalho TS, Lopes CV, Pereira-Lima JC. Malignancy in large colorectal lesions. *Arq Gastroenterol*. 2014;51(3):235-9.
25. Tahiliani HT, Purohit AP, Desai SC, Jarwani PB. Retrospective analysis of histopathological spectrum of premalignant and malignant colorectal lesions. *Cancer Res Stat Treat*. 2021;4(3):472-8.
26. Lee H, Hwang KH. Focal incidental colorectal fluorodeoxyglucose uptake: should it be spotlighted? *World J Clin Cases*. 2024;12(15):2466-74.
27. Shmidt E, Nehra V, Lowe V, Oxentenko AS. Clinical significance of incidental [18F]FDG uptake in the gas-

trointestinal tract on PET/CT imaging: a retrospective cohort study. *BMC Gastroenterol*. 2016;16(1):125.
28. Treglia G, Taralli S, Salsano M, Muoio B, Sadeghi R, Giovanella L. Prevalence and malignancy risk of focal colorectal incidental uptake detected by 18F-FDG-PET or PET/CT: a meta-analysis. *Radiol Oncol*. 2014;48(2):99-104.
29. Hui Y, Kung B, Yong TA. Incidental focal colonic uptake of 18F-fluorodeoxyglucose on positron emission tomography/computed tomography: its incidence and clinical significance. *Hong Kong J Radiol*. 2020;23(4):275-82.
30. Shrestha R, Adhikari M, Bharti SV, Shrestha A. Histopathological study of colorectal lesions and its correlation with colonoscopic findings. *J Nepalgunj Med Coll*. 2023;21(1):53-6.
31. Grassia R, Bodini P, Dizioli P, Staiano T, Iiritano E, Bianchi G, et al. Neuroendocrine carcinomas arising in ulcerative colitis: coincidences or possible correlations? *World J Gastroenterol*. 2009;15(33):4193-5.
32. Louis M, Lelli E, Aycinena F, Ellis E. Small cell carcinoma of the rectum associated with a tubulovillous adenoma: an atypical case presentation. *Cureus*. 2024;16(3):e55637.
33. Silva ML, Costa TM, Oliveira TS, Machado TRT, Lima CA. Poorly differentiated large cell neuroendocrine carcinoma of the transverse colon: case report. *Rev Bras Cancerol*. 2024;70(3):e-174725.
34. El Demellawy D, Khalifa MA, Ismili N, Wong S, Ghorab Z. Primary colorectal small cell carcinoma: a clinicopathological and immunohistochemical study of 10 cases. *Diagn Pathol*. 2007;2(1):35.
35. Nam S, Kim D, Jung K, Choi YJ, Kang JG. Analysis of the incidence and clinical features of colorectal nonadenocarcinoma in Korea: a national cancer registry-based study. *Ann Coloproctol*. 2020;36(6):390-7.
36. Huh JW. Colorectal nonadenocarcinoma in South Korea. *Ann Coloproctol*. 2020;36(6):359-60.
37. Ottaiano A, Santorsola M, Perri F, Pace U, Marra B, Correra M, et al. Clinical and molecular characteristics of rare malignant tumors of colon and rectum. *Biology (Basel)*. 2022;11(2):267.
38. Mahmoud AK, Gomaa WM, Eltiby DM. Clinico-epidemiological study of colorectal cancer patients diagnosed at endoscopy unit of two university hospitals in Cairo. *Int J Med Arts*. 2024;6(2):4098-105.
39. Ananmacharoen S, Cheeranont P, Nimmanon T, Boonya-Usadorn C. Synchronous advanced colorectal neoplasia: clinicopathologic features and prognostic significance. *Asian Pac J Cancer Prev*. 2023;24(5):1643-9.
40. Borda A, Martinez-Penuela J, Munoz-Navas M, Prieto C, Betes M, Borda F. [Synchronous neoplastic lesions in colorectal cancer: analysis of possible factors favoring their presentation]. *Rev Esp Enferm Dig*. 2008;100(3):139-45.
41. Borda A, Martinez-Penuela J, Prieto C, Munoz M, Carretero C, Borda F. [Study of frequency, distribution and diagnostic performance in synchronous neoplastic lesions of colorectal carcinoma]. *An Sist Sanit Navar*. 2008;31(1):9-16.
42. Prakash J. Analysis of lesions of colon: a histopathological study. *Int J Sci Res*. 2015;4(6):1234-7.
43. Dos Santos CEO, Perez HJ, Monkemuller K, Malaman D, Lopes CV, Pereira-Lima JC. Observer agreement for diagnosis of colorectal lesions with analysis of the vascular pattern by image-enhanced endoscopy. *Endosc Int Open*. 2015;3(3):E240-5.
44. Kim SE, Paik HY, Yoon H, Lee JE, Kim N, Sung MK. Sex- and gender-specific disparities in colorectal cancer risk. *World J Gastroenterol*. 2015;21(17):5167-5175.
45. Dos Santos CE, Malaman D, Sanmartin IDA, Leão AB, Leão GS, Pereira-Lima JC. Performance of artificial intelligence in the characterization of colorectal lesions. *Saudi J Gastroenterol*. 2023;29(4):219-24.
46. Sa S, Li J, Li X, Li Y, Liu X, Wang D, et al. Development and validation of a preoperative prediction model for colorectal cancer T-staging based on MDCT images and clinical information. *Oncotarget*. 2017;8(33):55308-20.
47. Popovici D, Stanisav C, Saftescu S, Negru S, Dragomir R, Ciurescu D, et al. Exploring the influence of age, gender and body mass index on colorectal cancer location. *Medicina (Kaunas)*. 2023;59(8):2020.
48. Ghane M, Ameli M, Mehrabani-Khasraghi S. Epidemiological characteristics of colorectal cancer and polyp. *Adv Stud Biol*. 2014;6(1):19-25.
49. Goracy J, Bogacz A, Uzar I, Wolek M, Lochynska M, Zietek P, et al. The analysis of NADPH quinone reductase 1 (NQO1) polymorphism in Polish patients with colorectal cancer. *Biomolecules*. 2021;11(7):1024.
50. Moug SJ, Fountas S, Johnstone MS, Bryce AS, Renwick A, Chisholm LJ, et al. Analysis of lesion localisation at colonoscopy: outcomes from a multi-centre UK

study. *Surg Endosc*. 2017;31(7):2959-67.
51. Nandish V, Sowmya B. Histopathological spectrum of colorectal carcinomas. *Indian J Pathol Oncol*. 2019;6(4):581-5.
52. Nayak J, Mohanty P, Lenka A, Sahoo N, Agrawala S, Panigrahi SK. Histopathological and immunohistochemical evaluation of CDX2 and Ki67 in colorectal lesions with their expression pattern in different histologic variants, grade, and stage of colorectal carcinomas. *J Microsc Ultrastruct*. 2021;9(4):183-9.