Acta Scientific Gastrointestinal Disorders (ISSN: 2582-1091)

Volume 8 Issue 2 February 2025

Research Article

Characteristics of Colonic Polyps in High-risk Omani Population

Joyce Sanyour[1]*, Issa Al Qarshoubi[1], Hasan Al-Sayegh[2] and Rasha Matar[1]

[1]Gastroenterology and Hepatology Department, Sultan Qaboos Comprehensive Cancer Care and Research Centre, University Medical City, Muscat, Oman

[2]MBChB, MPH, Research Laboratories Department, Sultan Qaboos Comprehensive Cancer Care and Research Centre, University Medical City, Muscat, Oman

***Corresponding Author:** Gastroenterology and Hepatology Department, Sultan Qaboos Comprehensive Cancer Care and Research Centre, University Medical City, Muscat, Oman.

Received: January 06, 2025

Published: January 19, 2025

Abstract

Background: The objective of the study is to describe the polyps and their characteristics in High-risk Omani population: histopathology, number per patient, location in relation to gender and age at diagnosis. The secondary objective is to evaluate the degree of dysplasia and its relation to the polyps' locations.

Methods: We conducted a retrospective descriptive study on all specimens of colonic polyps or endoscopically resected polyps from SCCCRC patients over a two-year period from 2022 to 2023. We categorized the patients by age, polyps' location, and histology. Associations between the polyps' characteristics were examined.

Results: With 197 endoscopy procedures and 394 polyps removed, 60.4% of the patient are more than 50yo with 1.18 sex ration (M/F). 53.8% had single polyps. Multiple polyps were found to be associated with advanced age, family history, positive genetic study, and FAP histology. Recto-sigmoid colon was the most common location for polyps. In patient age group < 50yo, rectum had the highest proportion of polyps. The older age group (>50yo) had more transverse colon polyps. Concerning histology, adenoma was the most common type without significant correlation between the histological type and the polyps' location. We found a significant association between histology and genetic pathologies. Nine of our patients had adenocarcinoma/degenerative polyps. Of the 394 polyps, 15 (3.8%) were synchronized cancers, 8 (2%) were Adenocarcinoma degenerative.

Conclusions: This is the first study in the Sultanate of Oman examining the characteristic of colonic polyps. This study gives valuable information about colonic polyp histology and genetic pathology in the Omani population, especially in high-risk groups.

Keywords: Colonic Polyp; Histology; Oman

Introduction

The prevalence of Colorectal polyps varies from one country to another [1] and is highly comparable between the two sexes [2]. 10% of sigmoidoscopy studies and more than 25% of colonoscopy studies showed colorectal polyps in asymptomatic patient [3].

Over 80% of polyps found in colonoscopy are diminutive (≤5 mm) [4] and found during routine procedures or colonoscopies done for another reason. Some authors suggest removing all polyps detected during colonoscopy and send them for pathologic evaluation [5] while others said that it is controversial to remove diminutive polyps [6].

Based on the 2019 WHO classification, the fifth edition, the tumors of the colon and the rectum are classified based on their histology into malignant and benign epithelial tumors. Malignant epithelial tumors are divided into adenocarcinoma and neuroendocrine neoplasm. Benign epithelial tumors are then divided into serrated lesions and polyps, conventional adenomas, and inflammatory bowel disease-associated dysplasia. Serrated lesions and polyps are further classified into hyperplastic polyps (HP), sessile serrated lesion (SSL), sessile serrated lesion with dysplasia (SSLD), traditional serrated adenoma (TSA) and unclassified serrated adenoma (USA) [7]. The risk of malignant transformation depends on the polyp's type, the polyp's size, and the degree of dysplasia [8].

Adenoma-carcinoma sequence is responsible for more than 95% of CRC development [9] with the time for development from adenomas to cancer is about 5 to 10 years [9,10] suggested by studies reporting the average age at presentation of patients with adenomatous polyps versus colorectal cancer (CRC).

Neoplastic lesions arise due to dysplastic proliferation and progression of polyps to carcinoma [11-13] and has traditionally

been characterized as a uniform progression from normal mucosa to adenoma and to carcinoma through an underlying homogenous carcinogenic pathway [10].

In many studies, it was shown that removing adenomas by endoscopic polypectomy or surgical resection decreased cancer risk [14].

The objective of this study is to describe the polyps and their characteristics in High-risk Omani population. Histopathology, number per patient, location in relation to gender and age at diagnosis were examined. The secondary objective is to evaluate the degree of dysplasia and its relation to the polyps' locations.

Methods

A retrospective descriptive study was conducted on all specimens of colonic polyps or endoscopically resected polyps from SCCCRC patients over a two-year period from 2022 to 2023**.** We collected demographic data (age and gender) and polyps' characteristics (number, location, histology and grade of dysplasia). We divided our patients according to age, sex, polyps' location (right colon, transverse colon, left colon, sigmoid and rectum), polyps' histology (hyperplastic, inflammatory, hamartomatous, serrated and adenoma) and degree of dysplasia (low or high). Adenomas were classified as tubular, tubulovillous, and villous adenomas.

Descriptive analyses were performed using frequencies and proportions. The Fisher exact test was used to analyze differences in the categorical variables. The Cochran-Armitage Test for Trend was used to examine the relation between the number of polyp and age, sex, family history, and genetic abnormality. Two-sided p-values ≤0.05 were considered statistically significant. The R statistical software was used in the analyses (R Foundation for Statistical Computing, Vienna, Austria).

Results

In this study, 197 endoscopy procedures (performed on 167 patients) were included during period of 2 year, most procedures (60.4%) were for older age group (≥50 years), 54.3% were for male patients.

59.7% of our patients had History of colon cancer.

Fifty-three (26.9%) of the procedures were for patients who had a family history of cancer.

Regarding the polyps, we found that 53.8%, 18.8%, 15.2%, 12.2% had single, two, three-to-five and more than five polyps, respectively.

Other characteristics of the study population are reported in Table 1.

Table 1: Characteristics of the study population (197 endoscopy procedures).

Variable	n (%)
Age (years)	
≤30	24/197 (12.2%)
30-50	54/197 (27.4%)
> = 50	119/197 (60.4%)
Gender	
Male	107/197 (54.3%)
Female	90/197 (45.7%)
Family History of cancer	
No	144/197 (73.1%)
Yes	53/197 (26.9%)
Number of polyps	
1	106/197 (53.8%)
2	37/197 (18.8%)
3-5	30/197 (15.2%)
≥6	24/197 (12.2%)
History of colon cancer	
No	79/196 (40.3%)
Yes	117/196 (59.7%)
Genetic study results, N = 44 tested	
Negative	7/44 (15.9%)
Bloom	5/44 (11.4%)
FAP	19/44 (43.2%)
Juvenile polyposis	2/44 (4.5%)
Lynch	5/44 (11.4%)
MUTYH	2/44 (4.5%)
Peutz Jeghers	1/44 (2.3%)
POLE gene	3/44 (6.8%)

In the correlation analysis (Table 2), older age group (≥50 years), positive family history, positive genetic study, and FAP histology were associated with higher number of polyps, while Lynch syndrome was associated with lower number of polyps. There was no statistically significant correlation between the sex and the number of polyps (p = 0.22).

Table 2: Number of polyps correlations with patients' age, gender, family history, and genetic abnormality (197 endoscopy procedures).

	Single polyp	Two polyps	3-5 polyps	6 or more polyps	p-value
Age (years)					<0.0001
<50	34/78 (43.6%)	13/78 (16.7%)	9/78 (11.5%)	22/78 (28.2%)	
≥50	72/119 (60.5%)	24/119 (20.2%)	21/119 (17.6%)	2/119 (1.7%)	
Gender					0.22
Male	54/107 (50.5%)	20/107 (18.7%)	18/107 (16.8%)	15/107 (14%)	
Female	52/90 (57.8%)	17/90 (18.9%)	12/90 (13.3%)	9/90 (10%)	
Family History of cancer					<0.0001
Negative	91/144 (63.2%)	25/144 (17.4%)	24/144 (16.7%)	4/144 (2.8%)	
Positive	15/53 (28.3%)	12/53 (22.6%)	6/53 (11.3%)	20/53 (37.7%)	
Genetic study					<0.0001
Negative	5/7 (71.4%)	1/7 (14.3%)	1/7 (14.3%)	0/7 (0%)	
Positive	5/37 (13.5%)	6/37 (16.2%)	5/37 (13.5%)	21/37 (56.8%)	
FAP					<0.0001
Negative	10/25 (40%)	5/25 (20%)	6/25 (24%)	4/25 (16%)	
Positive	0/19 (0%)	2/19 (10.5%)	0/19 (0%)	17/19 (89.5%)	
Bloom					0.9
Negative	9/39 (23.1%)	6/39 (15.4%)	5/39 (12.8%)	19/39 (48.7%)	
Positive	1/5 (20%)	1/5 (20%)	1/5 (20%)	2/5 (40%)	
Lynch					0.04
Negative	8/39 (20.5%)	5/39 (12.8%)	5/39 (12.8%)	21/39 (53.8%)	
Positive	2/5 (40%)	2/5 (40%)	1/5 (20%)	0/5 (0%)	

In the 197 endoscopy procedures, 394 polyps were identified. Polyps were found more in the rectum (140 [35.5%]) followed by transverse colon (85 [21.6%]) and sigmoid (56 [14.2%]). There were no significant differences between males and females regarding the polyps' location (table 3). Age was significantly associated with polyp location (p = 0.0005) with the rectum having the highest proportion of the younger age patients (91/140 (65%]), while transverse colon transverse had the highest proportion of the older age patients (57/85 (67.1%]).

Table 3: Tumor location association with age and sex.

	Rectum	Sigmoid	Descending	Transverse	Ascending	Cecum	p-value
Age							0.0005
<50	91/140 (65%)	27/56 (48.2%)	15/34 (44.1%)	28/85 (32.9%)	21/46 (45.7%)	14/33 (42.4%)	
≥50	49/140 (35%)	29/56 (51.8%)	19/34 (55.9%)	57/85 (67.1%)	25/46 (54.3%)	19/33 (57.6%)	
Gender							0.73
Male	86/140 (61.4%)	28/56 (50%)	19/34 (55.9%)	49/85 (57.6%)	24/46 (52.2%)	18/33 (54.5%)	
Female	54/140 (38.6%)	28/56 (50%)	15/34 (44.1%)	36/85 (42.4%)	22/46 (47.8%)	15/33 (45.5%)	

Most common histological type was TA (218 polyps, [55.3%]) followed by hyperplastic (113 polyps, [28.7%]).

Table 4 shows the frequencies and proportions of polyps' histology types by age, family history, and polyps' location. Overall, TA was the most common type in both age groups (128/196 [65.3%] in younger patients, 90/198 [45.5%] in the older group). Villous and hyperplastic histology types had highest proportions of older patients (66.7% and 66.4% respectively, p = 0.0331). Sex was also associated with histology (p = 0.0012). The highest proportion of females was seen in the serrated type (6/7 [85.7%]), the highest proportions of male were seen in others, villous, and TA types (100%, 67.7%, 63.3% respectively).

Table 4: Polyps' histology type by age, family history, and location (394 polyps).

	TA	TV	Villous	Serrated	Hyperplastic	Inflammatory	Other	p-value
Age								0.0331
<50	128/218 (58.7%)	16/39 (41%)	2/6 (33.3%)	5/7 (71.4%)	38/113 (33.6%)	3/6 (50%)	4/5 (80%)	
≥50	90/218 (41.3%)	23/39 (59%)	4/6 (66.7%)	2/7 (28.6%)	75/113 (66.4%)	3/6 (50%)	1/5 (20%)	
Sex								0.0012
Male	138/218 (63.3%)	18/39 (46.2%)	4/6 (66.7%)	1/7 (14.3%)	57/113 (50.4%)	1/6 (16.7%)	5/5 (100%)	
Female	80/218 (36.7%)	21/39 (53.8%)	2/6 (33.3%)	6/7 (85.7%)	56/113 (49.6%)	5/6 (83.3%)	0/5 (0%)	
Family History of cancer								0.61
No	113/218 (51.8%)	25/39 (64.1%)	6/6 (100%)	2/7 (28.6%)	93/113 (82.3%)	2/6 (33.3%)	2/5 (40%)	
Yes	105/218 (48.2%)	14/39 (35.9%)	0/6 (0%)	5/7 (71.4%)	20/113 (17.7%)	4/6 (66.7%)	3/5 (60%)	
Location								0.244
Rectum	71/218 (32.6%)	16/39 (41%)	6/6 (100%)	3/7 (42.9%)	39/113 (34.5%)	3/6 (50%)	2/5 (40%)	
Sigmoid	29/218 (13.3%)	9/39 (23.1%)	0/6 (0%)	1/7 (14.3%)	17/113 (15%)	0/6 (0%)	0/5 (0%)	
Descending	24/218 (11%)	3/39 (7.7%)	0/6 (0%)	0/7 (0%)	6/113 (5.3%)	1/6 (16.7%)	0/5 (0%)	
Transverse	55/218 (25.2%)	3/39 (7.7%)	0/6 (0%)	2/7 (28.6%)	23/113 (20.4%)	1/6 (16.7%)	1/5 (20%)	
Ascending	23/218 (10.6%)	3/39 (7.7%)	0/6 (0%)	1/7 (14.3%)	17/113 (15%)	1/6 (16.7%)	1/5 (20%)	
Cecum	16/218 (7.3%)	5/39 (12.8%)	0/6 (0%)	0/7 (0%)	11/113 (9.7%)	0/6 (0%)	1/5 (20%)	

No significant correlation between the location and the types of the polyps was detected (p = 0.244).

Table 5 shows the dysplasia grade by age, gender, family history, and location for 263 adenoma (TA, TV, and Villous) polyps. There was no significant association between dysplasia, and age, gender, or family history. Histology type distribution was statistically different between the dysplasia groups (p = 0.0345). The low-grade dysplasia polyps were more likely to be TA, while high-grade dysplasia group had a higher TV proportion compared to the other groups.

Genetic information was available for 194 polyps (shown in table 6). There was a significant association between the histology types and genetic pathologies. The serrated histology type had the highest proportion of Bloom (5/5, 100%), TV type had the highest proportion of FAP (12/14, 85.7%), while inflammatory type had the highest proportion of Peutz Jeghers (3/4, 75%).

Nine patients had adenocarcinoma/degenerative polyps. Of the 394 polyps, 15 (3.8%) were synchronized cancers, 8 (2%) were Adenocarcinoma degenerative. Adenocarcinoma/degenerative polyps and synchronized cancers did not show significant association with the histology type.

Table 5: Dysplasia grade association with age, gender, family history, histology, and location for 263 adenoma polyps (T, TV, and V).

Variable	Dysplasia 1 High Grade	Dysplasia 2 Low Grade	Dysplasia 3 No	p-value
Age				0.83
<50	15 (60.0%)	124 (55.4%)	7 (50.0%)	
≥ 50	10 (40.0%)	100 (44.6%)	7 (50.0%)	
Total	25	224	14	
Gender				0.21
Male	13 (52.0%)	141 (62.9%)	6 (42.9%)	
Female	12 (48.0%)	83 (37.1%)	8 (57.1%)	
Total	25	224	14	
Family history				0.26
No	17 (68.0%)	118 (52.7%)	9 (64.3%)	
Yes	8 (32.0%)	106 (47.3%)	5 (35.7%)	
Total	25	224	14	
Histology				0.0345
TA	16 (64.0%)	191 (85.3%)	11 (78.6%)	
TV	8 (32.0%)	29 (12.9%)	2 (14.3%)	
Villous	1 (4.0%)	4 (1.8%)	1 (7.1%)	
Total	25	224	14	
Location				0.39
Rectum	13 (52.0%)	75 (33.5%)	5 (35.7%)	
Sigmoid	2 (8.0%)	33 (14.7%)	3 (21.4%)	
Descending	1 (4.0%)	25 (11.2%)	1 (7.1%)	
Transverse	7 (28.0%)	48 (21.4%)	3 (21.4%)	
Ascending	0 (0%)	26 (11.6%)	0 (0%)	
Cecum	2 (8.0%)	17 (7.6%)	2 (14.3%)	
Total	25	224	14	

Table 6: Histology and genetic results (N = 194 polyps with available genetic information.

Genetic	TA	TV	Serrated	Hyperplastic	Inflammatory	Other	p-value
Test results							0.76
Positive	96/103 (93.2%)	13/14 (92.9%)	5/5 (100%)	11/13 (84.6%)	4/4 (100%)	3/3 (100%)	
Negative	7/103 (6.8%)	1/14 (7.1%)	0/5 (0%)	2/13 (15.4%)	0/4 (0%)	0/3 (0%)	
Pathology							
Bloom	10/103 (9.7%)	0/14 (0%)	5/5 (100%)	3/13 (23.1%)	0/4 (0%)	0/3 (0%)	<0.0001
FAP	68/103 (66%)	12/14 (85.7%)	0/5 (0%)	2/13 (15.4%)	0/4 (0%)	0/3 (0%)	<0.0001
Juvenile Polyposis	4/103 (3.9%)	0/14 (0%)	0/5 (0%)	2/13 (15.4%)	0/4 (0%)	3/3 (100%)	0.0006
Lynch	7/103 (6.8%)	0/14 (0%)	0/5 (0%)	1/13 (7.7%)	1/4 (25%)	0/3 (0%)	0.47
MUTYH	3/103 (2.9%)	1/14 (7.1%)	0/5 (0%)	1/13 (7.7%)	0/4 (0%)	0/3 (0%)	0.5
Peutz Jeghers	0/103 (0%)	0/14 (0%)	0/5 (0%)	0/13 (0%)	3/4 (75%)	0/3 (0%)	<0.0001
POLE	4/103 (3.9%)	0/14 (0%)	0/5 (0%)	2/13 (15.4%)	0/4 (0%)	0/3 (0%)	0.43

Note: No genetic results are available for the Villous type.

Discussion

In our population, we noted a male predominance with a sex ratio (M/F) of 1.18. There was no statistically significant difference between the two sexes in terms of polyps' number and location. Concerning the histopathology, Male showed more tubular and villous adenoma.

In the literature, women are less likely to have CRC, advanced adenomas, and non-advanced adenomas [15]. And several studies demonstrated male predominance [5,16–18]. Heather S., *et al*. showed the predominance of the male sex in adenoma (63%) and the female sex in hyperplastic polyps (51.6%) [19].

Concerning the location, McCashland TM., *et al*. showed that right-sided polyps are more prevalent in women [20]. And other studies showed that the presence of multiple polyps was positively associated with the male sex ($p < 0.0001$) [20].

Also Colonic polyps are strongly associated with old age 21. In our study, 60.4% of polyps presented in patient age more than 50 years.

Most of our patients had single polyps (53.8%) as demonstrated by Lowenfels., *et al*. where he found approximately two-thirds of patients had solitary polyps [22].

Multiple polyps were found to be more commonly associated with advanced age ($p = 0.001$) [19], and in patient with FAP and family history [23].

In our study, the higher number of polyps was found in patients more than 50years, positive family history, positive genetic study, and FAP histology.

Concerning the location, 49.7% of our patients had recto-sigmoid polyp, with no significant different between male and female. The same result was found in most of the studies which reported left side polyps' predominance [1,16,20,24–26]. But a few other studies showed that patients had more right sided polyps [19,27,28].

In our patient with age group < 50yo, rectum had the highest proportion of polyps. But the older age group had more transverse colon polyps. Some authors showed that polyps were most commonly located in the right colon in patients over 50 [29,30] and other authors found no age-related differences in polyp distribution [31].

In our population, adenoma is the most common type followed by hyperplastic polyps without significant correlation between the histological type and the location.

Most of the studies had similar results where adenomas were the most frequent type and tubular adenomas were the most common subtype [9,16,19,29,32]. Some studies showed that hyperplastic polyps were the most common type of non-neoplastic polyps [33]. William AR., *et al*. found that the most frequent lesion in the colon is the hyperplastic polyps [34,35].

But concerning the location, most of the studies showed that adenomas were localized more in the left colon [36,37], serrated polyps predominant in the right side of the colon and the hyperplastic polyps are mainly presented in the left colon [38–40]. In addition, tubule-villous and villous adenomas are more likely to be found in the rectum [36].

In our population, Tubular adenoma was the most common type in both age groups whereas Villous and hyperplastic histology types had higher proportions of older patients (>50yo).

But the studies showed that the presence of adenoma increased with age [26]. Laird-Fick HS., *et al*. showed also that adults aged more than 50 had adenoma as the most common histopathological findings [19]. The prevalence of hyperplastic polyps in autopsy studies in individuals younger than 50 years of age has been documented as 7–40%. In individuals over the age of 50 years, the prevalence of hyperplastic polyps is 20–40% usually located in the rectum or sigmoid colon [34].

We found that high-grade dysplasia groups are higher TV proportion compared to the other groups, but without significant association between dysplasia, and age, gender, location, or family history.

O'Brien., *et al*. showed that high Grade dysplasia is more presented in the left side polyps [32] (38) and Villous component are more likely to have High grade dysplasia [32,36].

Limitation

It's a retrospective single-centre study, concerning the histology of colorectal polyps in Only High-risk patient diagnosed and followed in cancer centre.

Another limitation of this study is the lacking data concerning all the Histology subtype of serrated polyps.

Conclusion

This is the first study in Sultanate of Oman concerning the characteristic of colonic polyps specially in high-risk group. This study gives valuable information about colonic polyp in Omani population where we noted male predominance and mainly in a patient more than 50years old. Multiple polyps were found in elderly patient, family history and patient with positive genetic stud

Bibliography

1. Ferlitsch M., *et al*. "Sex-specific prevalence of adenomas, advanced adenomas, and colorectal cancer in individuals undergoing screening colonoscopy". *JAMA* 306.12 (2011): 1352-1358.

2. Heitman SJ., *et al*. "Prevalence of adenomas and colorectal cancer in average risk individuals: a systematic review and meta-analysis". *Clinical Gastroenterology and Hepatology* 7.12 (2009): 1272-1278.

3. Giacosa A., *et al*. "Epidemiology of colorectal polyps". *Tech Coloproctology* 8 (2004): s243-247.

4. Herszényi L. "The "Difficult" Colorectal Polyps and Adenomas: Practical Aspects". *Digestive Diseases (Basel, Switzerland)* 37.5 (2019): 394-399.

5. Markowitz AJ and Winawer SJ. "Management of colorectal polyps". *CA: A Cancer Journal for Clinicians* 47.2 (1997): 93-112.

6. von Renteln D and Pohl H. "Polyp Resection - Controversial Practices and Unanswered Questions". *Clinical and Translational Gastroenterology* 8.3 (2017): e76.

7. Kim JH and Kang GH. "Evolving pathologic concepts of serrated lesions of the colorectum". *Journal of Pathology and Translational Medicine* 54.4 (2020): 276-289.

8. Colucci PM., *et al*. "Colorectal polyps". *Clinical Medical Research* 1.3 (2003): 261-262.

9. Bond JH. "Polyp guideline: diagnosis, treatment, and surveillance for patients with colorectal polyps. Practice Parameters Committee of the American College of Gastroenterology". *American Journal of Gastroenterology* 95.11 (2000): 3053-3063.

10. Leslie A., *et al*. "The colorectal adenoma-carcinoma sequence". *British Journal of Surgery* 89.7 (2002): 845-860.

11. Noffsinger AE. "Serrated polyps and colorectal cancer: new pathway to malignancy". *Annual Review of Pathology* 4 (2009): 343-364.

12. Snover DC. "Update on the serrated pathway to colorectal carcinoma". *Human Pathology* 42.1 (2011): 1-10.

13. Leggett B and Whitehall V. "Role of the serrated pathway in colorectal cancer pathogenesis". *Gastroenterology* 138.6 (2010): 2088-2100.

14. Loeve F., *et al*. "National Polyp Study data: evidence for regression of adenomas". *International Journal of Cancer*. 111.4 (2004): 633-639.

15. Hoffmeister M., *et al*. "Male sex and smoking have a larger impact on the prevalence of colorectal neoplasia than family history of colorectal cancer". *Clinical Gastroenterology and Hepatology* 8.10 (2010): 870-876.

16. Solakoğlu T., *et al*. "Analysis of 2222 colorectal polyps in 896 patients: a tertiary referreal hospital study. *Turkish Journal of Gastroenterology* 25.2 (2014): 175-179.

17. Rex DK. "Colonoscopy: a review of its yield for cancers and adenomas by indication". *American Journal of Gastroenterology* 90.3 (1995): 353-365.

18. Nusko G., *et al*. "Risk related surveillance following colorectal polypectomy". *Gut* 51.3 (2002): 424-428.

19. Laird-Fick HS., *et al*. "Colonic polyp histopathology and location in a community-based sample of older adults". *BMC Gastroenterology* 16.1 (2016): 90.

20. McCashland TM., *et al*. "Gender differences in colorectal polyps and tumors". *American Journal of Gastroenterology* 96.3 (2001): 882-886.

21. Ashktorab H., *et al*. "Prevalence and features of colorectal lesions among Hispanics: A hospital-based study". *World Journal of Gastroenterology* 21.46 (2015): 13095-13100.

22. Lowenfels AB., *et al*. "Determinants of polyp size in patients undergoing screening colonoscopy". *BMC Gastroenterology* 11 (2011): 101.

23. Menon G., *et al*. "Familial Adenomatous Polyposis". In: StatPearls. StatPearls Publishing (2024).

24. Almadi MA., *et al*. "Prevalence and characteristics of colonic polyps and adenomas in 2654 colonoscopies in Saudi Arabia". *Saudi Journal of Gastroenterology* 20.3 (2014): 154-161.

25. Khodadoostan M., *et al*. "Clinical and pathological characteristics of colorectal polyps in Iranian population". *East African Journal of Public Health*. 7.2 (2010): 157-159.

26. Pendergrass CJ., *et al*. "Occurrence of colorectal adenomas in younger adults: an epidemiologic necropsy study". *Clinical Gastroenterology and Hepatology* 6.9 (2008): 1011-1015.

27. Qumseya BJ., *et al*. "The effect of polyp location and patient gender on the presence of dysplasia in colonic polyps". *Clinical and Translational Gastroenterology* 3.7 (2012): e20.

28. Santos JM dos., *et al*. "Analysis of colorrectal polyps in 3.491 videocolonoscopies". *Revista Brasileira de Coloproctologia* 28 (2008): 299-305.

29. Silva SM., *et al*. "Influence of patient age and colorectal polyp size on histopathology findings". *Arquivos brasileiros de cirurgia digestiva : ABCD = Brazilian Archives of Digestive Surgery* 27.2 (2014): 109-113.

30. Lieberman DA., *et al*. "Risk factors for advanced colonic neoplasia and hyperplastic polyps in asymptomatic individuals". *JAMA* 290.22 (2004): 2959-2967.

31. Okamoto M., *et al*. "Relationship between age and site of colorectal cancer based on colonoscopy findings". *Gastrointestinal Endoscopy* 55.4 (2002): 548-551.

32. O'Brien MJ., *et al*. "The National Polyp Study. Patient and polyp characteristics associated with high-grade dysplasia in colorectal adenomas". *Gastroenterology* 98.2 (1992): 371-379.

33. Bensen SP., *et al*. "Colorectal hyperplastic polyps and risk of recurrence of adenomas and hyperplastic polyps. Polyps Prevention Study". *Lancet Lond Engl*. 354.9193 (1999): 1873-1874.

34. Williams AR., *et al*. "Polyps and cancer of the large bowel: a necropsy study in Liverpool". *Gut* 23.10 (1982): 835-842.

35. Spjut H and Estrada RG. "The significance of epithelial polyps of the large bowel". *Pathology Annuals* 12.1 (1972): 147-170.

36. Gschwantler M., *et al*. "High-grade dysplasia and invasive carcinoma in colorectal adenomas: a multivariate analysis of the impact of adenoma and patient characteristics". *European Journal of Gastroenterology and Hepatology* 14.2 (2002): 183-188.

37. Pommergaard HC., *et al*. "The association between location, age and advanced colorectal adenoma characteristics: a propensity-matched analysis". *Scandinavian Journal of Gastroenterology* 52.1 (2017): 1-4.

38. Carr NJ., *et al*. "Serrated and non-serrated polyps of the colorectum: their prevalence in an unselected case series and correlation of BRAF mutation analysis with the diagnosis of sessile serrated adenoma". *Journal of Clinical Pathology* 62.6 (2009): 516-518.

39. Meseeha M and Attia M. "Colon Polyps". In: StatPearls. StatPearls Publishing (2024).

40. Lash RH., *et al*. "Sessile serrated adenomas: prevalence of dysplasia and carcinoma in 2139 patients". *Journal of Clinical Pathology* 63.8 (2010): 681-686.