Publisher
MEDRESEARCH
www.medresearch.in

International Journal of Medical Research and Review

2023 Volume 11 Number 1 January February

E-ISSN:2320-8686
P-ISSN:2321-127X

Research Article
Colon polyps

Characteristics of Polyps in Lebanese population

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DOI: https://doi.org/10.17511/ijmrr.2023.i01.01

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Background: The objective of this study is to describe the characteristics of the polyps in the Lebanese population and evaluate dysplasia and its relation to the polyps' locations. **Methods:** A retrospective descriptive study was conducted at the Department of the National Institute of Pathology in Lebanon and comprised a biopsy of colonic polyps or resected polyps from patients from 2007 to 2009. We collected demographic data and polyps' characteristics. Then, we divided patients according to age sex, location, and histology. **Results:** With 2298 polyps in 1470 patients, the mean age was 57.45 with 68% aged more than 50yo. 75.6% have one polyp and multiple polyps are more commonly found in older patients (> 50 years). More than 20 % of polyps are found in the recto-sigmoid area. In the right colon, people older than 50 years were more likely to have polyps (19%) compared to those < 30 years (8.3%) ($p < 0.05$). In the rectum, people < 30 years were more likely to have polyps compared to those > 50 years ($p < 0.01$). Concerning histology, tubular adenoma is the most common type and is more prevalent in the left colon. Hyperplastic polyps are mainly found in the recto-sigmoid area and mainly in the age group 30-50 in contrast to adenomatous polyps found over 50yo. Adenocarcinomas and/or degenerative polyps were founded in 5.9% of our population. **Conclusion:** This study gives valuable information on colorectal polyps in the Lebanese population regarding age, sex, dominant histology and anatomic location. We noted a male predominance and mainly above 50 years old. The majority had single polyps, and>50% of polyps were localized in the rectosigmoid. Adenomatous polyps were the most common type.

Keywords: Colon polyps, histology, Lebanon

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How to Cite this Article

Abou Rached Antoine, Sanyour Joyce, Saba Jowana, Abou Khalil Melissa, Rasha Matar, Khalil Pierre, Khairallah Saad, Characteristics of Polyps in Lebanese population. Int J Med Res Rev. 2023;11(1):1-9.
Available From
https://ijmrr.medresearch.in/index.php/ijmrr/article/view/1407

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Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2022-12-15	2022-12-17	2022-12-24	2022-12-31	2023-01-07

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
Nil	Nil	Yes	16%	

Introduction

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

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

Based on the 2019 WHO classification, the fifth edition, the tumours of the colon and the rectum are classified based on their histology into malignant and benign epithelial tumours. Malignant epithelial tumours are divided into adenocarcinoma and neuroendocrine neoplasm. Benign epithelial tumours 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 lesions (SSL), sessile serrated lesions 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].

Neoplastic lesions arise due to dysplastic proliferation and progression of polyps to carcinoma and have traditionally been characterized as a uniform progression from normal mucosa to adenoma and carcinoma through an underlying homogenous carcinogenic pathway [9-15]. Studies reporting the average age at presentation of patients with adenomatous polyps versus colorectal cancer (CRC) suggest that the time for development from adenomas to cancer is about 5 to 10 years [15, 16].

The adenoma-carcinoma sequence is responsible for more than 95% of CRC development [16]. In many studies, it was shown that removing adenomas by endoscopic polypectomy or surgical resection decreased cancer risk [17-19].

The primary objective of this study is to describe the polyps in the Lebanese population: histopathology, number per patient, and 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.

Materials and Methods

This is a cross-sectional retrospective descriptive multi-centric study, conducted at the Department of the National Institute of Pathology Beirut, Lebanon for 3 years (from 2007 to 2009), All the pathology reports of patients with polyps were reviewed and all information was collected.

Demographic data (age and gender) and polyps' characteristics (number, location, histology and grade of dysplasia) were collected. Patients were divided into three groups according to age (less than 30 years, between 30 and 50 years and more than 50 years), sex (male or female), 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.

All patients with hyperplastic, inflammatory, hamartomatous, serrated and adenoma polyps were included. Patients with the lipoma or other submucosal lesions were excluded

All patients who underwent colonoscopy and had polyp(s) during this period of three years were included in the study, after approval from the institutional ethics committee.

Data were analyzed using the Statistical Package for Social Science software, version 21.0 (SPSS Inc., Chicago, IL, USA). For all variables (age, gender, location, histology and dysplasia), descriptive statistics were conducted, including means and standard deviations for continuous variables, and frequencies for categorical variables.

The distribution of histopathology and polyp location were compared by age and gender by chi-square or Fisher's exact probability tests to calculate the odd ratios (ORs) and 95% confidence interval (CI). The differences with a two-sided p-value < 0.05 were considered statistically significant.

Results

During this study period of 3 years, 1470 patients were found to have one or more polyps. The mean age of the patients was 57.45 years (SD: 16.3, min: 1, max: 92). When dividing the patients into the 3 age groups, 6.5% were aged less than 30 years, 25.4% between 30-50 years and 68% more than 50 years. Furthermore, 58% of the patients were male and 42% were female with a sex ratio M/F: 1.38.

Regarding the number of polyps, a total of 2298 polyps were identified in 1470 patients. We found that 75.6%, 14.9%, 7.3% and 2.2% had 1, 2, 3-5 and more than 5 polyps, respectively. Younger people (< 30 years) are more likely to have a single polyp (94.3%) and none of them had more than 5 polyps. Whereas multiple polyps (≥ 2) were more commonly found in older people (> 50 years) (Table 1). There is no statistically significant correlation between the sex and the number of polyps ($p = 0.155$).

Polyps were more commonly found in the rectum (31.2%) and sigmoid colon (29.8%), followed by the right colon (18.4%), the left colon (11.2%) and the transverse colon (9.4%), without correlation between the sex and polyps' location. We found a statistically significant difference between the 3 age groups in the right colon and the rectum. In the right colon, people older than 50 years were more likely to have polyps (19%) compared to those < 30 years (8.3%) ($p < 0.05$). In the rectum, younger people (< 30 years) were more likely to have polyps compared to those > 50 years ($p < 0.01$) (Table 2). 20% of patients had polyps in more than one segment of the colon. Multiples polyps are more likely to be found in the right colon (14.4%) than in the left colon (8%) ($p = 0.02$).

Of the 2298 polyps identified, the most common histologic type was adenoma (45.3%), with tubular adenomas found in 83.6% of cases, and tubulovillous and villous adenomas found in 16.4% of cases. High-grade dysplasia was seen in 13.8% of tubular adenomas, it increased to 48.5% in tubulovillous adenomas, and it was significantly more prevalent in the left colon than in the right colon ($p=0.005$).

Hyperplastic polyps represented 41.7% of cases followed by inflammatory polyps (11%) and serrated (2%). Additionally, we found

A history of inflammatory bowel disease in 25.7% of inflammatory polyps (UC: 87%, Crohn's disease: 13%). There was no significant difference between the 2 sexes in terms of histology. We noted a significant correlation between the location and the type of polyps. Hyperplastic polyps represented 62.1% and 53.4% of rectal and sigmoid polyps, respectively. Whereas adenomatous polyps are predominant in the transverse (52.3%) and ascending (47.8%) colon. The most common site for serrated polyps was the transverse colon (6.8%). No predilection was statistically proven for inflammatory polyps regarding location. (Table 3). Regarding the adenomatous polyps, we studied whether the presence of tubular and tubulovillous/villous adenomas is more prevalent in a specific part of the colon. The results showed that the statistical significance lies in people with rectal adenomas. In the rectum, tubulovillous and villous adenomas are more likely to be found (34.7%) compared to tubular adenomas (20.2%). All other colonic locations have no predilection for a specific type of adenoma. (Table 4)

When correlating the histology to the age groups, hyperplastic polyps were more likely to be found in the age group 30-50 years old ($p < 0.01$), adenomatous polyps in people over 50 years of age ($p < 0.01$) and inflammatory polyps in people younger than 30 years old ($p < 0.01$) (Table 5).

Adenocarcinomas and/or degenerative polyps were founded in 5.9% of our sample population. There was no statistically significant difference between synchronized cancer and polyps' type except for inflammatory polyps where cancer occurred less likely (5.3% vs. 13.4%, $p = 0.043$) (Table 6).

Table 1: Polyps' number according to the age

			Age Group		
			< 30 years	30-50 years	> 50 years
Number	1 polyp	Count	66	228	516
		%	94.3%	82.9%	69.9%
	2 polyps	Count	4	36	133
		%	5.7%	13.1%	18.0%
	3 to 5 polyps	Count	0	9	70
		%	0.0%	3.3%	9.5%
	> 5 polyps	Count	0	2	19
		%	0.0%	0.7%	2.6%
Total		Count	70	275	738
		%	100.0%	100.0%	100.0%

Table 2: Polyps' location according to the age

			Age Group			p-value
			< 30 years	30 - 50 years	> 50 years	
Location	Ascending	Count	4	20	70	<0.05
		%	8.3%	11.8%	19.0%	
	Transverse	Count	0	11	23	0.198
		%	0.0%	6.5%	6.3%	
	Descending	Count	4	10	32	0.535
		%	8.3%	5.9%	8.7%	
	Sigmoid	Count	12	51	134	0.151
		%	25.0%	30.2%	36.4%	
	Rectum	Count	28	77	109	<0.01
		%	58.3%	45.6%	29.6%	

Table 3: Correlation between polyps' type and location

							p-value
		Ascending	Transverse	Descending	Sigmoid	Rectum	
Hyperplastic	Count	34	12	24	124	180	<0.01
	%	30.1%	27.3%	38.1%	53.4%	62.1%	
Adenoma	Count	54	23	29	76	54	<0.01
	%	47.8%	52.3%	46.0%	32.8%	18.6%	
Serrated	Count	4	3	1	4	1	0.017
	%	3.5%	6.8%	1.6%	1.7%	0.3%	
Inflammatory	Count	21	6	9	28	55	0.245
	%	18.6%	13.6%	14.3%	12.1%	19.0%	

Table 4: Adenoma subtypes and location

					p-value
			Tubular	Tubulovillous or Villous	
Location	Ascending	Count	55	8	0.210
		%	24.7%	16.3%	
	Transverse	Count	22	2	0.196
		%	9.9%	4.1%	
	Descending	Count	27	5	0.708
		%	12.1%	10.2%	
	Sigmoid	Count	74	17	0.839
		%	33.2%	34.7%	
	Rectum	Count	45	17	0.028
		%	20.2%	34.7%	

Table 5: Correlation between polyps' type and age.

			<30 years	30-50 years	>50 years	p-value
Histology	Hyperplastic	Count	27	146	221	<0.01
		%	39.7%	60.1%	36.7%	
	Adenoma	Count	11	61	306	<0.01
		%	16.2%	25.1%	50.8%	
	Serrated	Count	0	3	12	0.398
		%	0%	1.2%	2%	
	Inflammatory	Count	30	33	63	<0.01
		%	44.1%	13.6%	10.5%	

Table 6: Correlation between polyps' type and synchronized cancer

			Associated Cancer		p-value
			No	Yes	
Type Overview	Hyperplastic	Count	476	32	0.704
		%	40.4%	42.7%	
	Adenoma	Count	518	38	0.261
		%	44.0%	50.7%	
	Serrated	Count	25	1	0.641
		%	2.1%	1.3%	
	Inflammatory	Count	158	4	0.043
		%	13.4%	5.3%	

Discussion

Gender: In our study, we noted a male predominance with a sex ratio (M/F) of 1.38. There was no statistically significant difference between the two sexes in terms of polyps' number, location and histology. Several studies showed male predominance [5, 20-22]. It's well known that women are less likely to have CRC, advanced adenomas, and non-advanced adenomas [23]. Heather S. et al demonstrated the predominance of the male sex in adenoma (63%) and the female sex in hyperplastic polyps (51.6%) [24]. Laird-Fick et al. demonstrated that the presence of multiple polyps was positively associated with the male sex ($p < 0.0001$). McCashland TM et al. showed that right-sided polyps are more prevalent in women [25].

Age: In this study, the mean age was 57.4 years and 68% of polyps occurred in patients more than 50 years. The presence of polyps was found to be strongly associated with old age [26].

A number of polyps: We found that the majority of our patients had single polyps (75.6%). When divided into the 3 age groups, we found that single polyps were more commonly found in young patients aged less than 30 years (94%), whereas multiples polyps (³ 2 polyps) were more common in older patients (30%). According to Lowenfels et al., approximately two-thirds of patients had solitary polyps [27]. And multiple polyps were found to be more commonly associated with advanced age ($p = 0.001$) [24].

Location: We found that 74% of polyps were located in the recto-sigmoid area. In the age group < 30 years, we noted the highest prevalence of left colonic polyps compared to the other groups.

Older patients had more polyps in the right colon ($p < 0.05$). Most studies have reported a preponderance of left-sided polyps [2, 21, 25, 28-32]. Few studies showed that patients had more right-sided polyps [24, 33, 34]. In patients over the age of 50, polyps were most commonly located in the right colon [35, 36]. Other authors, however, have found no age-related differences in polyp distribution [37].

Histology: In our study, adenomas were the most common type of polyps, with tubular adenomas being the most common subtype, followed by hyperplasic polyps. The latter was more prevalent in patients less than 50 years compared to older age groups whereas adenomas were more likely to be found in people over 50 years. When correlating location and histology, we found that hyperplastic polyps were more common in the rectum and the sigmoid colon, while adenomas are more commonly found in the transverse and right colon, serrated polyps in the transverse colon and no statistically significant predilection was found for inflammatory polyps in regard to location. We also found that, in the adenomatous polyps' subtypes, there was a significant difference between tubular and tubulovillous/villous adenomas only in the rectum where tubulovillous and villous adenomas are more likely to be found. Several studies were consistent with our results where adenomas were the most frequent type, and tubular adenomas were the most common subtype [16, 21, 24, 35, 38].

The prevalence of adenomas increases with age, especially over the age of 50 [30]. Laird-Fick HS et al. found that in adults aged 50 years and older, adenomas were the most common histopathological finding (59.9 %) [24]. In a large sample of adenomatous polyps, 76.5% of adenomas were localized in the left colon while other studies showed that adenomas and advanced adenomas detected by screening colonoscopy tended to be located in the left colon and rectum [39-41]. Hyperplastic polyps are mainly presented in the left colon and serrated polyps are predominately located on the right side of the colon [42-47]. In addition, tubulovillous and villous adenomas are more likely to be found in the rectum [39, 48-50].

In our study, high-grade dysplasia was more commonly seen in tubulovillous adenoma (48.5%), and it was significantly more prevalent in the left colon than in the right colon. O'Brien et al. Showed that left-sided polyps have more chance for high-grade dysplasia [38]. The increased frequency of high-grade dysplasia in left-sided colonic adenomatous polyps was mainly related to the villous component [38]. Gschwantler M et al. showed that 86.6% of adenomatous polyps had low-grade dysplasia and 13.4% had high-grade dysplasia, also high-grade dysplasia was more common in left-sided polyps and tubulovillous and villous architecture were also more prevalent in the left side colon [39].

We found that hyperplastic polyps were the second most common type (41%), more commonly found in the rectosigmoid area and patients aged between 30 and 50 years. Some studies found that hyperplastic polyps were the most common type of non-neoplastic polyps [51-53].

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 [54-57]. Williams AR et al found that the most frequently occurring lesion in the colon is the hyperplastic polyp [54, 58].

In the current study, inflammatory polyps were more predominant in patients less than 30 years and we found a history of inflammatory bowel disease in 25.7% of inflammatory polyps (UC: 87%, Crohn's disease: 13%). Inflammatory polyps are a common finding in IBD [59]. They are found more often in UC than in CD, and some authors have reported a double prevalence in UC as compared with colonic CD [60]. The peak overall incidence of inflammatory polyps is at the ages of 20-40 years, due to the predominant association with IBD [61].

Limitations

It's a retrospective single-centre study, concerning the histology of colorectal polyps in Lebanese for 3 years.

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

Conclusion

The strength of the study is the large sample size where the pathological data of 1470 patients with 2298 polyps were analyzed.

What does this study add to existing knowledge?

This study gives valuable information on colorectal polyps in the Lebanese population about age group, sex predominance, dominant histology, and most common anatomic location. We noted a male predominance and mainly in a patient more than 50 years old. The majority of patients had single polyps, and more than 50% of polyps were localized in the rectosigmoid. Adenomatous polyps were the most common type.

This study shows the change in the number, type and location of polyps depending on the age group in the Lebanese population.

Author contributions

- Constructing an idea or hypothesis for research and/or manuscript: Dr Antoine Abou Rached
- Planning methodology to conclude Dr Antoine Abou Rached, Dr Saad Khairallah.
- Organizing and supervising the course of the project or the article and taking responsibility: Dr Antoine Abou Rached, Dr Joyce Sanyour, Dr Saad Khairallah.
- Taking responsibility for the execution of the experiments, patient follow-up, data management and reporting: Dr Melissa Abou Khalil, Dr Pierre Khalil.
- Taking responsibility for the logical interpretation and presentation of the results: Dr Melissa Abou Khalil, Dr Pierre Khalil, Dr Jowana Saba
- Taking responsibility for literature review and in the construction of the whole or body of the manuscript: Dr Joyce Sanyour, Dr Antoine Abou Rached, Dr Rasha Matar, Dr Jowana Saba.
- Reviewing the article before submission not only for spelling and grammar but also for its intellectual content: Dr Antoine Abou Rached, Dr Joyce Sanyour, Dr Rasha Matar, and Dr Jowana Saba.

Reference

01. Heitman SJ, Ronksley PE, Hilsden RJ, Manns BJ, Rostom A, Hemmelgarn BR. Prevalence of adenomas and colorectal cancer in average risk individuals: a systematic review and meta-analysis. Clin Gastroenterol Hepatol. 2009;7(12):1272-1278. *doi:10.1016/j.cgh.2009.05.032 [Crossref][PubMed] [Google Scholar]*

02. Ferlitsch M, Reinhart K, Pramhas S, et al. Sex-specific prevalence of adenomas, advanced adenomas, and colorectal cancer in individuals undergoing screening colonoscopy. JAMA. 2011;306(12):1352-1358. *doi:10.1001/jama.2011.1362 [Crossref][PubMed] [Google Scholar]*

03. Giacosa A, Frascio F, Munizzi F. Epidemiology of colorectal polyps. Tech Coloproctol. 2004;8 Suppl 2:s243-247. *doi:10.1007/s10151-004-0169-y [Crossref][PubMed][Google Scholar]*

04. Herszényi L. The "Difficult" Colorectal Polyps and Adenomas: Practical Aspects. DDI. 2019;37(5):394-399. *doi:10.1159/000495694 [Crossref][PubMed][Google Scholar]*

05. Markowitz AJ, Winawer SJ. Management of colorectal polyps. CA Cancer J Clin. 1997;47(2):93-112. *doi:10.3322/canjclin.47.2.93 [Crossref] [PubMed][Google Scholar]*

06. von Renteln D, Pohl H. Polyp Resection - Controversial Practices and Unanswered Questions. Clin Transl Gastroenterol. 2017;8(3):e76. *doi:10.1038/ctg.2017.6 [Crossref][PubMed][Google Scholar]*

07. Kim JH, Kang GH. Evolving pathologic concepts of serrated lesions of the colorectum. J Pathol Transl Med. 2020;54(4):276-289. *doi:10.4132/jptm.2020.04.15 [Crossref][PubMed] [Google Scholar]*

08. Colucci PM, Yale SH, Rall CJ. Colorectal Polyps. Clin Med Res. 2003;1(3):261-262. *[Crossref] [PubMed][Google Scholar]*

09. Grahn SW, Varma MG. Factors that increase risk of colon polyps. Clin Colon Rectal Surg. 2008;21(4):247-255. *doi:10.1055/s-0028-1089939 [Crossref][PubMed][Google Scholar]*

10. Kim EC, Lance P. Colorectal polyps and their relationship to cancer. Gastroenterol Clin North Am. 1997;26(1):1-17. *doi:10.1016/s0889-8553(05)70280-6 [Crossref][PubMed][Google Scholar]*

11. Noffsinger AE. Serrated polyps and colorectal cancer: new pathway to malignancy. Annu Rev Pathol. 2009;4:343-364. *doi:10.1146/annurev.pathol.4.110807.092317 [Crossref][PubMed][Google Scholar]*

12. Jass JR. Classification of colorectal cancer based

On correlation of clinical, morphological and molecular features. Histopathology. 2007;50(1):113-130. *doi:10.1111/j.1365-2559.2006.02549.x [Crossref][PubMed][Google Scholar]*

13. Snover DC. Update on the serrated pathway to colorectal carcinoma. Hum Pathol. 2011;42(1):1-10. *doi:10.1016/j.humpath.2010.06.002 [Crossref] [PubMed][Google Scholar]*

14. Leggett B, Whitehall V. Role of the serrated pathway in colorectal cancer pathogenesis. Gastroenterology. 2010;138(6):2088-2100. *doi:10.1053/j.gastro.2009.12.066 [Crossref] [PubMed][Google Scholar]*

15. Leslie A, Carey FA, Pratt NR, Steele RJC. The colorectal adenoma-carcinoma sequence. Br J Surg. 2002;89(7):845-860. *doi:10.1046/j.1365-2168.2002.02120.x [Crossref][PubMed][Google Scholar]*

16. Bond JH. Polyp guideline: diagnosis, treatment, and surveillance for patients with colorectal polyps. Practice Parameters Committee of the American College of Gastroenterology. Am J Gastroenterol. *2000;95(11):3053-3063. doi:10.1111/j.1572-0241.2000.03434.x [Crossref][PubMed][Google Scholar]*

17. Selby JV, Friedman GD, Quesenberry CP, Weiss NS. A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. N Engl J Med. 1992;326(10):653-657. *doi:10.1056/NEJM199203053261001 [Crossref] [PubMed][Google Scholar]*

18. Loeve F, Boer R, Zauber AG, et al. National Polyp Study data: evidence for regression of adenomas. Int J Cancer. 2004;111(4):633-639. *doi:10.1002/ijc.20277 [Crossref][PubMed][Google Scholar]*

19. Jørgensen OD, Kronborg O, Fenger C. The Funen Adenoma Follow-up Study. Incidence and death from colorectal carcinoma in an adenoma surveillance program. Scand J Gastroenterol. *1993;28(10):869-874. doi:10.3109/00365529309103127 [Crossref] [PubMed][Google Scholar]*

20. Nusko G, Mansmann U, Kirchner T, Hahn EG. Risk related surveillance following colorectal polypectomy. Gut. 2002;51(3):424-428. *Doi:10.1136/gut.51.3.424 [Crossref][PubMed] [Google Scholar]*

21. Solakoğlu T, Atalay R, Köseoğlu H, et al. Analysis of 2222 colorectal polyps in 896 patients: a tertiary referreal hospital study. Turk J Gastroenterol. 2014;25(2):175-179. *doi:10.5152/tjg.2014.5059 [Crossref][PubMed] [Google Scholar]*

22. Rex DK. Colonoscopy: a review of its yield for cancers and adenomas by indication. Am J Gastroenterol. 1995;90(3):353-365. *[Crossref] [PubMed][Google Scholar]*

23. Hoffmeister M, Schmitz S, Karmrodt E, et al. Male sex and smoking have a larger impact on the prevalence of colorectal neoplasia than family history of colorectal cancer. Clin Gastroenterol Hepatol. 2010;8(10):870-876. *doi:10.1016/j.cgh.2010.07.004 [Crossref][PubMed] [Google Scholar]*

24. Laird-Fick HS, Chahal G, Olomu A, Gardiner J, Richard J, Dimitrov N. Colonic polyp histopathology and location in a community-based sample of older adults. BMC Gastroenterol. 2016;16(1):90. *doi:10.1186/s12876-016-0497-1 [Crossref] [PubMed][Google Scholar]*

25. McCashland TM, Brand R, Lyden E, de Garmo P, CORI Research Project. Gender differences in colorectal polyps and tumors. Am J Gastroenterol. 2001;96(3):882-886. *doi:10.1111/j.1572-0241.2001.3638_a.x [Crossref][PubMed][Google Scholar]*

26. Ashktorab H, Laiyemo AO, Lee E, et al. Prevalence and features of colorectal lesions among Hispanics: A hospital-based study. World J Gastroenterol. 2015;21(46):13095-13100. *doi:10.3748/wjg.v21.i46.13095 [Crossref][PubMed] [Google Scholar]*

27. Lowenfels AB, Williams JL, Holub JL, Maisonneuve P, Lieberman DA. Determinants of polyp size in patients undergoing screening colonoscopy. BMC Gastroenterol. 2011;11:101. *doi:10.1186/1471-230X-11-101 [Crossref][PubMed] [Google Scholar]*

28. Almadi MA, Alharbi O, Azzam N, Wadera J, Sadaf N, Aljebreen AM. Prevalence and characteristics of colonic polyps and adenomas in 2654 colonoscopies in Saudi Arabia. Saudi

J Gastroenterol. 2014;20(3):154-161. *doi:10.4103/1319-3767.132986 [Crossref][PubMed] [Google Scholar]*

29. Khodadoostan M, Fatemi R, Maserat E, et al. Clinical and pathological characteristics of colorectal polyps in Iranian population. East Afr J Public Health. 2010;7(2):157-159. *[Crossref][PubMed] [Google Scholar]*

30. Pendergrass CJ, Edelstein DL, Hylind LM, et al. Occurrence of colorectal adenomas in younger adults: an epidemiologic necropsy study. Clin Gastroenterol Hepatol. 2008;6(9):1011-1015. *doi:10.1016/j.cgh.2008.03.022 [Crossref][PubMed] [Google Scholar]*

31. Patel K, Hoffman NE. The anatomical distribution of colorectal polyps at colonoscopy. J Clin Gastroenterol. 2001;33(3):222-225. *doi:10.1097/00004836-200109000-00011 [Crossref][PubMed][Google Scholar]*

32. Tony J, Harish K, Ramachandran TM, Sunilkumar K, Thomas V. Profile of colonic polyps in a southern Indian population. :3. . *[Crossref][PubMed][Google Scholar]*

33. Qumseya BJ, Coe S, Wallace MB. The Effect of Polyp Location and Patient Gender on the Presence of Dysplasia in Colonic Polyps. Clin Transl Gastroenterol. 2012;3(7):e20. *doi:10.1038/ctg.2012.14 [Crossref][PubMed] [Google Scholar]*

34. Santos JM dos, Felício F, Lyra Junior HF, Martins MRC, Cardoso FB. Analysis of colorrectal polyps in 3. 491 videocolonoscopies. Revista Brasileira de Coloproctologia. *2008;28(3):299-305. doi:10.1590/S0101-98802008000300005 [Crossref] [PubMed][Google Scholar]*

35. Silva SM e, Rosa VF, Santos ACN dos, Almeida RM de, Oliveira PG de, Sousa JB de. Influence of patient age and colorectal polyp size on histopathology findings. Arq Bras Cir Dig. 2014;27(2):109-113. *doi:10.1590/s0102-67202014000200006 [Crossref][PubMed][Google Scholar]*

36. Lieberman DA, Prindiville S, Weiss DG, Willett W, VA Cooperative Study Group 380. Risk factors for advanced colonic neoplasia and hyperplastic polyps in asymptomatic individuals. JAMA. 2003;290(22):2959-2967. *Doi:10.1001/jama.290.22.2959 [Crossref][PubMed] [Google Scholar]*

37. Okamoto M, Shiratori Y, Yamaji Y, et al. Relationship between age and site of colorectal cancer based on colonoscopy findings. Gastrointest Endosc. 2002;55(4):548-551. *doi:10.1067/mge.2002.122335 [Crossref][PubMed] [Google Scholar]*

38. O'Brien MJ, Winawer SJ, Zauber AG, et al. The National Polyp Study. Patient and polyp characteristics associated with high-grade dysplasia in colorectal adenomas. Gastroenterology. *1990;98(2):371-379 [Crossref][PubMed][Google Scholar]*

39. Gschwantler M, Kriwanek S, Langner E, et al. High-grade dysplasia and invasive carcinoma in colorectal adenomas: a multivariate analysis of the impact of adenoma and patient characteristics. Eur J Gastroenterol Hepatol. 2002;14(2):183-188. *doi:10.1097/00042737-200202000-00013 [Crossref][PubMed][Google Scholar]*

40. Pommergaard H-C, Burcharth J, Rosenberg J, Raskov H. The association between location, age and advanced colorectal adenoma characteristics: a propensity-matched analysis. Scand J Gastroenterol. 2017;52(1):1-4. *doi:10.1080/00365521.2016.1218929 [Crossref] [PubMed][Google Scholar]*

41. Imperiale TF, Wagner DR, Lin CY, Larkin GN, Rogge JD, Ransohoff DF. Results of screening colonoscopy among persons 40 to 49 years of age. N Engl J Med. 2002;346(23):1781-1785. *doi:10.1056/NEJM200206063462304 [Crossref] [PubMed][Google Scholar]*

42. Carr NJ, Mahajan H, Tan KL, Hawkins NJ, Ward RL. 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. J Clin Pathol. 2009;62(6):516-518. *doi:10.1136/jcp.2008.061960 [Crossref][PubMed] [Google Scholar]*

43. Waye JD, Bilotta JJ. Rectal hyperplastic polyps: now you see them, now you don't--a differential point. Am J Gastroenterol. 1990;85(12):1557-1559. *[Crossref][PubMed][Google Scholar]*

44. Meseeha M, Attia M.

Colon Polyps. In: StatPearls. StatPearls Publishing; 2020. *Accessed January 11, 2021. [Article] [Crossref][PubMed][Google Scholar]*

45. Spring KJ, Zhao ZZ, Karamatic R, et al. High prevalence of sessile serrated adenomas with BRAF mutations: a prospective study of patients undergoing colonoscopy. Gastroenterology. 2006;131(5):1400-1407. *doi:10.1053/j.gastro.2006.08.038 [Crossref] [PubMed][Google Scholar]*

46. Lash RH, Genta RM, Schuler CM. Sessile serrated adenomas: prevalence of dysplasia and carcinoma in 2139 patients. J Clin Pathol. 2010;63(8):681-686. *doi:10.1136/jcp.2010.075507 [Crossref][PubMed][Google Scholar]*

47. Higuchi T, Sugihara K, Jass JR. Demographic and pathological characteristics of serrated polyps of colorectum. Histopathology. 2005;47(1):32-40. *doi:10.1111/j.1365-2559.2005.02180.x [Crossref] [PubMed][Google Scholar]*

48. Stulc JP, Petrelli NJ, Herrera L, Mittelman A. Colorectal villous and tubulovillous adenomas equal to or greater than four centimeters. Ann Surg. 1988;207(1):65-71. *doi:10.1097/00000658-198801000-00013 [Crossref][PubMed][Google Scholar]*

49. Wilcox GM, Anderson PB, Colacchio TA. Early invasive carcinoma in colonic polyps. A review of the literature with emphasis on the assessment of the risk of metastasis. Cancer. *1986;57(1):160-171. doi:10.1002/1097-0142(19860101)57:1<160::aid-cncr2820570132>3.0.co;2-n [Crossref][PubMed] [Google Scholar]*

50. Wolff WI, Shinya H. Definitive treatment of "malignant" polyps of the colon. Ann Surg. 1975;182(4):516-525. *doi:10.1097/00000658-197510000-00018 [Crossref][PubMed][Google Scholar]*

51. Estrada RG, Spjut HJ. Hyperplastic polyps of the large bowel. Am J Surg Pathol. 1980;4(2):127-133. *doi:10.1097/00000478-198004000-00004 [Crossref][PubMed][Google Scholar]*

52. Achord JL. Hyperplastic colon polyps do not predict adenomas. Gastroenterology. 1991;100(4):1142-1143. *doi:10.1016/0016-5085(91)90297-x [Crossref][PubMed][Google Scholar]*

53. Bensen SP, Cole BF, Mott LA, Baron JA, Sandler RS, Haile R. Colorectal hyperplastic polyps and risk of recurrence of adenomas and hyperplastic polyps. Polyps Prevention Study. Lancet. *1999;354(9193):1873-1874. doi:10.1016/s0140-6736(99)04469-4 [Crossref][PubMed][Google Scholar]*

54. Williams AR, Balasooriya BA, Day DW. Polyps and cancer of the large bowel: a necropsy study in Liverpool. Gut. 1982;23(10):835-842. *[Crossref] [PubMed][Google Scholar]*

55. Vatn MH, Stalsberg H. The prevalence of polyps of the large intestine in Oslo: an autopsy study. Cancer. 1982;49(4):819-825. *doi:10.1002/1097-0142(19820215)49:4<819::aid-cncr2820490435>3.0.co;2-d [Crossref][PubMed] [Google Scholar]*

56. Weston AP, Campbell DR. Diminutive colonic polyps: histopathology, spatial distribution, concomitant significant lesions, and treatment complications. Am J Gastroenterol. 1995;90(1):24-28. *[Crossref][PubMed][Google Scholar]*

57. Provenzale D, Garrett JW, Condon SE, Sandler RS. Risk for colon adenomas in patients with rectosigmoid hyperplastic polyps. Ann Intern Med. 1990;113(10):760-763. *doi:10.7326/0003-4819-113-10-760 [Crossref][PubMed][Google Scholar]*

58. H S, Rg E. The significance of epithelial polyps of the large bowel. Pathol Annu. 1977;12 Pt 1:147-170. *[Crossref][PubMed][Google Scholar]*

59. Buck JL, Dachman AH, Sobin LH. Polypoid and pseudopolypoid manifestations of inflammatory bowel disease. Radiographics. 1991;11(2):293-304. *doi:10.1148/radiographics.11.2.2028064 [Crossref] [PubMed][Google Scholar]*

60. Margulis AR, Goldberg HI, Lawson TL, et al. The overlapping spectrum of ulcerative and granulomatous colitis: a roentgenographic-pathologic study. Am J Roentgenol Radium Ther Nucl Med. 1971;113(2):325-334. *doi:10.2214/ajr.113.2.325 [Crossref][PubMed] [Google Scholar]*

61. Politis DS, Katsanos KH, Tsianos EV, Christodoulou DK. Pseudopolyps in inflammatory bowel diseases: Have we learned enough? World J Gastroenterol. 2017;23(9):1541-1551. doi:10. *3748/wjg.v23.i9.1541 [Crossref][PubMed][Google Scholar]*