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ORIGINAL ARTICLE

Observational Study

Polyp detection rate and pathological features in patients undergoing a comprehensive colonoscopy screening

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Abstract

AIM

To identify the prevalence, and clinical and pathologic characteristic of colonic polyps among Iranian patients undergoing a comprehensive colonoscopy, and determine the polyp detection rate (PDR) and adenoma detection rate (ADR).

METHODS

In this cross-sectional study, demographics and epidemiologic characteristics of 531 persons who underwent colonoscopies between 2014 and 2015 at Mehrad gastrointestinal clinic were determined. Demographics, indication for colonoscopy, colonoscopy findings, number of polyps, and histopathological characteristics of the polyps were examined for each person.

RESULTS

Our sample included 295 (55.6%) women and 236 (44.4%) men, with a mean age of 50.25 ± 14.89 years. Overall PDR was 23.5% (125/531). ADR and colorectal cancer detection rate in this study were 12.8% and 1.5%, respectively. Polyps were detected more significantly frequently in men than in women (52.8% *vs* 47.2%, $P < 0.05$). Polyps can be seen in most patients after the age of 50. The average age of patients with cancer was significantly higher than that of patients with polyps (61.3 years *vs* 56.4 years, $P < 0.05$). The majority of the polyps were adenomatous. More than 50% of the polyps were found in the rectosigmoid part of the colon.

CONCLUSION

The prevalence of polyps and adenomas in this study is less than that reported in the Western populations. In our patients, distal colon is more susceptible to developing polyps and cancer than proximal colon.

Key words: Adenoma detection; Polyp detection; Iran; Colonoscopy; Screening

Core tip: One of the major reasons for colonoscopy is detection of colon polyps, such as adenomas. Early diagnosis and endoscopic removal of adenomatous polyps is one of the main objectives for screening and prevention of colorectal cancer (CRC). Given that, only few studies are available in the national literature regarding the assessment of colorectal polyps, but none has explicitly noted the rate of polyp detection. Nevertheless, our study provides comprehensive information about clinical and epidemiological features of colorectal polyps. Therefore, the results of this study can provide a good infrastructure for the next preventive program and have clinical implications for CRC screening.

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INTRODUCTION

Colorectal cancer (CRC) is the third most common malignant disease in both men and women worldwide, accounting for more than 8% of mortality in the world with approximately 1.4 million new cases a year[1-4].

CRC is also the third most common cancer in men and women in Asia[5,6]. In the Asia-Pacific region, the incidence varies between regions, with high incidence in Australia, and Eastern Asia, and low incidence in South-central Asia[7]. According to the International Agency for Research on Cancer, the incidence of CRC in many Asian countries is similar to that in many Western countries[8]. CRC is also the third most common cancer in Iranians, after excluding skin cancer, and it occurs at younger ages with an increasing trend similar to that in the Asia-Pacific countries[1,9]. These increasing rates may result from the young age structure and low rates of colon cancer in older people of these countries[6,10,11].

Almost all CRCs develop from colorectal polyps. Over a period of ten years, most of adenomatous polyps can be converted to colon carcinoma[12,13]. Given that the process of conversion of colorectal adenomas into adenocarcinoma is very long and slow[14], early detection and endoscopic removal of these precancerous lesions are very effective in reducing the incidence and mortality rate of CRC[15-17].

CRC is a suitable disease for screening[18]. However, due to a lack of comprehensive screening strategy and public acceptance, this program is not implemented in many countries. Nevertheless, access to the CRC screening is an important key to reducing the burden of CRC. Endoscopic screening is comprised of four techniques including sigmoidoscopy, colonoscopy, barium enema, and computed tomographic colonography[19]. Colonoscopy is a highly specific and the most effective screening tool for detecting colonic polyps and CRC[20].

Limited data are available in the national literature regarding the assessment of colorectal polyps[21-25]. Understanding of the prevalence of colorectal polyps especially adenomas in the general population would help clarify the efficacy of a CRC screening program. Therefore, updating the current knowledge in the scope of colorectal polyps and CRC is essential. Hence, identifying the features of colon polyps (*e.g.*, distribution, location, and histology type) has great implications for developing national screening guidelines for CRC[26,27]. In this study, we aimed to determine the baseline polyp and adenoma prevalence in persons who underwent colonoscopies for various indications as well as opportunistic screening for CRC. We also assessed the polyp detection rate (PDR) and adenoma detection rate (ADR), and evaluated the clinical and histological

Table 1 Patients' characteristics and colonoscopy findings

Variable	All (n = 531)
Sex	
Male, n (%)	236 (44.4)
Female, n (%)	295 (55.6)
Age	
Mean years (SD)	50.3 ± 15.4
Age groups	
⩽ 50 yr	250 (47.1)
> 50 yr	281 (52.9)
Family history	
Yes	150 (28.2)
No	381 (71.8)
Indication, n (%)	
Screening	120 (22.6)
Gastrointestinal bleeding	90 (17.0)
Constipation	82 (15.5)
Diarrhea	74 (14.0)
Abdominal pain	70 (13.3)
Inflammatory bowel disease	65 (12.2)
Others	29 (5.4)
Patients with at least 1 polyp, n (%)	
Neoplastic polyps	68 (54.4)
Non-neoplastic polyps	57 (45.6)
Cancer, n (%)	8 (1.5)

characteristics of colorectal polyps in Iranian patients and Iranian volunteers for CRC screening.

MATERIALS AND METHODS

Study design

In this cross-sectional study, all data were extracted from a colonoscopy database and pathology reports maintained by Mehrad gastrointestinal clinic in Iran. We included all persons aged 15 to 85 years, who underwent their first time colonoscopy during 2014-2015. Patients who had previously been identified with colon polyp or colorectal malignancies including CRC, colonic resection, active colitis, active diverticulitis and familial adenomatous polyposis were excluded from the study. We collected the data on demographic variables, indications for colonoscopy, and family history of colorectal malignancies. Family history was defined as having a first degree relative with CRC. For all colorectal lesions, data on clinical and pathological features (*i.e.*, number, size, site, and grade of dysplasia) were obtained. The study was approved by the Research Institute for Gastroenterology and Liver Diseases, Shahid Beheshti University of Medical Sciences.

Polyp classification

All polyps identified during colonoscopy were biopsied or removed endoscopically and submitted for histopathology. The overall PDR was defined as the proportion of procedures in which at least one polyp was detected over the total number of colonoscopies. ADR was defined as the number of colonoscopies in which one or more adenomas was detected, divided by the total number of colonoscopies performed by the endoscopist[28].

Pathological features of colorectal lesions were determined using the World Health Organization criteria[28]. Hyperplastic and adenomatous polyps were classified as non-neoplastic polyps and neoplastic polyps, respectively. Microscopically, adenomas were categorized architecturally as serrated, tubular, tubular-villous, and villous.

The locations of the polyps were defined as proximal colon including the transverse colon, hepatic flexure, ascending colon, and cecum, and distal colon including the rectum, sigmoid, descending colon, and splenic flexure.

The polyp size was classified as small (< 5 mm), medium (5-9 mm), or large (> 10 mm). Estimation of polyp size was performed by the endoscopist using the diameter of the open biopsy forceps, which is about 8 mm. In the event of multiple polyps, only the size of the largest was considered for the purposes of analysis. Degrees of dysplasia observed in the adenomas were graded as low (mild and moderate) or high grade (severe). Patients with no polyps were regarded as normal.

Statistical analysis

Categorical variables are expressed as numbers and percentages. χ^2 or Fisher's exact test, where appropriate, was used for analysis of categorical variables. Continuous variables are expressed as medians, or as means and standard deviation, and 95%CI as appropriate. The Student's t-test was used for comparisons of means. All analyses were performed using SPSS version 21.0 (SPSS INC, Chicago, IL, United States). A two-tailed $P < 0.05$ was considered statistically significant.

RESULTS

Demographic and historical data

During the period of study (2014-2015), 531 persons met the inclusion criteria. Our sample included 55.6% of women and 44.4% of men. The age range was 15-85 years with a mean of 50.3 ± 15.4 years and a median of 52 years. The patients were divided into two age-groups (⩽ 50 and > 50 years). The majority of patients was over 50 years (52.9%). One hundred and fifty (28.2%) patients had a family history of polyps or CRC in our study.

The most common reasons for colonoscopy included screening (asymptomatic adults aged 50 years and older and with a family history of CRC) in 22.6%, and lower gastrointestinal bleeding in 17.0%. Other indications for colonoscopy were constipation (15.4%), diarrhea (13.9%), abdominal pain (13.1%), inflammatory bowel disease (12.2%), and others (5.4%). Other referral indications included bloating, reflux, weight loss, anemia, fatty liver, and irritable bowel syndrome (Table 1).

Study outcomes and colonoscopy findings

Based on colonoscopy findings, the overall PDR was

Table 2 Detection rates of different histologic types of polyps and cancer by gender

Histologic type of polyps	Gender		Total
	Male (%)	Female (%)	
Neoplastic			
Tubular	18 (53.0)	16 (47.0)	34 (100)
Tubulo-villous	13 (68.4)	6 (31.6)	19 (100)
Villous	4 (40.0)	6 (60.0)	10 (100)
Serrated	3 (60.0)	2 (40.0)	5 (100)
Adenomatous polyps	38 (55.9)	30 (44.1)	68 (100)
Non-neoplastic			
Hyperplastic	28 (40.6)	29 (45.3)	57 (100)
Total PDR	66 (52.8)	59 (47.2)	125 (100)
Cancer	5 (62.5)	3 (37.5)	8 (100)
Total	69 (51.9)	64 (48.1)	133 (100)

PDR: Polyp detection rate.

Table 3 Detection rates of different histologic types of polyps and cancer by age

Histologic type of polyps	Age-groups		Total
	⩽ 50 yr	> 50 yr	
Neoplastic			
Tubular	6 (17.6)	28 (82.4)	34 (100)
Tubulo-villous	7 (36.8)	12 (63.2)	19 (100)
Villous	3 (30.0)	7 (70.0)	10 (100)
Serrated	3 (60.0)	2 (40.0)	5 (100)
Adenomatous polyps	19 (28.0)	49 (72.0)	68 (100)
Non-neoplastic			
Hyperplastic	19 (33.3)	38 (66.7)	57 (100)
Total PDR	38 (30.4)	87 (69.6)	125 (100)
Cancer	1 (12.5)	7 (87.5)	8 (100)
Total	39 (29.3)	94 (70.7)	133 (100)

PDR: Polyp detection rate.

Table 4 Detection rates of different histologic types of polyps and cancer by family history

Histologic type of polyps	Family history		Total
	No (%)	Yes (%)	
Neoplastic			
Tubular	26 (76.4)	8 (23.6)	34 (100)
Tubulo-villous	13 (68.4)	6 (31.6)	19 (100)
Villous	5 (50.0)	5 (50.0)	10 (100)
Serrated	2 (40.0)	3 (60.0)	5 (100)
Adenomatous polyps	46 (67.6)	22 (32.4)	68 (100)
Non-neoplastic			
Hyperplastic	46 (80.7)	11 (19.3)	57 (100)
Total PDR	92 (73.6)	33 (26.4)	125 (100)
Cancer	0 (0)	8 (100)	8 (100)
Total	92 (69.2)	41 (30.8)	133 (100)

PDR: Polyp detection rate.

Table 5 Detection rates of different histologic types of polyps by location

Histologic type of polyps	Location		Total
	Proximal colon (%)	Distal colon (%)	
Neoplastic			
Tubular	10 (26.3)	28 (73.7)	38 (100)
Tubulo-villous	9 (40.9)	13 (59.1)	22 (100)
Villous	3 (30.0)	7 (70.0)	10 (100)
Serrated	3 (37.5)	5 (62.5)	8 (100)
Adenomatous polyps	25 (32.0)	53 (68.0)	78 (100)
Non-neoplastic			
Hyperplastic	19 (31.7)	41 (68.3)	60 (100)
Total PDR	44 (31.9)	94 (68.1)	138 (100)

PDR: Polyp detection rate.

23.5% (125/531). According to histopathology results from 125 patients with at least one polyp, 54.4% of the lesions were neoplastic polyps and 45.6% were hyperplastic polyps (non-neoplastic polyps). The overall ADR in this study was 12.8% (68/531). The percentage of male patients with polyps was significantly higher than that of female patients (52.8% *vs* 47.2%, $P < 0.05$). CRC was detected in 1.5% (8/531) of the total population (men, 62.5%; women, 37.5%) (Table 2). The mean age of patients with polyp was 56.4 ± 13.5 years. Polyps can be seen in most patients after the age of 50 (69.6%). CRC was more frequently observed in patients aged from 60 to 80 years. The average age of patients with cancer was significantly higher than that of those with polyps (61.3 ± 19.7 years *vs* 56.4 ± 13.5 years, $P < 0.05$) (Table 3). In addition, the relationship between PDR and family history of CRC or polyps was assessed and this was found not to be statistically significant ($P > 0.05$), while all patients with CRC in this study had a family history (Table 4).

Histopathological characteristics of the polyps

Totally 138 polyps were removed by colonoscopy in this study. Among the 138 polyps, 56.5% were neoplastic and the others were non-neoplastic. All non-neoplastic polyps were hyperplastic. Among the 78 neoplastic polyps, the common histologic types were tubular adenomas (48.7%), tubule-villous adenomas (28.2%), villous adenomas (12.8%), and serrated adenomas (10.2%).

The prevalence of polyps in distal colon was higher than that in proximal colon (68.1% *vs* 31.9%, $P < 0.05$). Accordingly, most of cancers were located in the distal colon compared with the proximal colon (75% *vs* 25%, $P < 0.05$) (Table 5). Overall polyps were frequently detected in the rectum (32.0%), sigmoid (24.6%), transverse colon (16%), and ascending and descending colon (10.1%), and the others located in the cecum (5%), and splenic and hepatic flexure (2.1%) (Table 6).

Data about the size of polyps were available for only 75 polyps; 33.3% were smaller than 5 mm as small size, 40% were between 5-9 mm as medium size and 26.7% were more than 10 mm as large size (Table 7). According to the degree of dysplasia observed in the adenomas, most of patients (52.6%) had mild grade, 24.4% had moderate, and 23% had severe grade of dysplasia (Table 8).

Table 6 Detection rates of different histologic types of polyps by colonic segments

Polyps	Location								Total
	Ascending colon	Transverse colon	Descending colon	Sigmoid	Rectum	Cecum	Hepatic flexure	Splenic flexure	
Tubular	3 (7.9)	5 (13.2)	4 (10.5)	7 (18.4)	16 (42.1)	1 (2.6)	1 (2.6)	1 (2.6)	38 (100)
Tubulo-villous	4 (18.2)	3 (13.6)	2 (9.1)	6 (27.3)	5 (22.7)	2 (9.1)	0 (0)	0 (0)	22 (100)
Villous	0 (0)	1 (10)	0 (0)	2 (20)	5 (50)	2 (20)	0 (0)	0 (0)	10 (100)
Serrated	0 (0)	3 (37.5)	1 (12.5)	3 (37.5)	1 (12.5)	0 (0)	0 (0)	0 (0)	8 (100)
Hyperplastic	7 (11.7)	10 (16.7)	7 (11.7)	16 (26.7)	17 (28.3)	2 (3.3)	0 (0)	1 (1.7)	60 (100)
Total	14 (10.1)	22 (16.0)	14 (10.1)	34 (24.6)	44 (32.0)	7 (5.1)	1 (0.7)	2 (1.4)	138 (100)

Table 7 Detection rates of different histologic types of polyps by size

Size	Histologic type					Total
	Hyperplastic	Tubular	Tubul-villous	villous	Serrated	
Small	11 (44.0)	0 (0)	14 (56.0)	0 (0)	0 (0)	25 (100)
Medium	14 (46.7)	0 (0)	12 (40.0)	0 (0)	4 (13.3)	30 (100)
Large	0 (0)	8 (40.0)	3 (15.0)	9 (45.0)	0 (0)	20 (100)
Unknown	35 (55.6)	2 (3.2)	9 (14.3)	13 (20.6)	4 (6.3)	63 (100)
Total	60 (43.5)	10 (7.2)	38 (27.5)	22 (16.0)	8 (5.8)	138 (100)

Data available for only 75 polyps.

Table 8 Detection rates of different histologic types of polyps by degree of dysplasia

Grade	Histologic type				Total
	Tubular	Tubul-villous	Villous	Serrated	
Mild	21 (51.2)	11(26.9)	6 (14.6)	3 (7.3)	41 (100)
Moderate	11 (57.9)	3 (15.8)	3 (15.8)	2 (10.5)	19 (100)
Severe	6 (33.3)	8 (44.5)	1 (5.5)	3 (16.7)	18 (100)
Total	38 (48.7)	22 (28.2)	10 (12.9)	8 (10.2)	78 (100)

DISCUSSION

The PDR and ADR rates obtained in this study are low, when compared to the figures from most Western and some Asian countries. In a large multicenter study from Italy, the median detection rate for polyps was 35%[29]. A large colonoscopy series from Spain reported a PDR of 45.8%[30]. Similar studies from Mayo Clinic in the United States and France reported PDR of 49% and 35.5%, and ADR of 31% and 17.7%, respectively[31,32]. In some Asian countries like Korea, China and Thailand, PDR and ADR were similar to those in Europeans and Americans[33-36]. However, our findings are similar to reports from Kuwait, Malaysia and Oman where PDR of 20% and ADR of 10%, 11.5% and 12.1% were reported, respectively[37-39]. While in African countries like Nigeria these rates were reported to be lower than our results (PDR, 16.1%; ADR, 6.8%)[40]. The mean age of the studied population was relatively young (50.3 years) and it might decrease the ADR because adenomas have been demonstrated to be more frequent in those older than 50 years of age.

The overall estimate for PDR in our study was 23.5%, while ADR was 12.8%. The percentage of male patients with polyps was significantly higher than that of female patients (52.8% *vs* 47.2%, $P < 0.05$). These data are consistent with the other reports that support gender differences in the prevalence of colon polyps and cancer[27,40,41].

Older age is the most important predictor for the prevalence of adenomas and cancer. In our study, the PDR and cancer prevalence reached a peak in the 6th decade of life. Nonetheless, the average age of patients with cancer was significantly higher than that of patients with polyps (61.3 years *vs* 56.4 years, $P < 0.05$). Studies from the Middle East and the Western countries also mentioned a significant increase in the risk of CRC, in particular after the age of 50 years[24,28,42].

Based on increasing prevalence of CRC in the sixth decade of life, regular screening should begin at the age of 50. However, people at higher risk of developing CRC should begin screening at a younger age[43,44].

The tubular type was the most common histological feature of adenomas in the present study, in accordance with the results of other reports[21,27,45]. Polyps were detected significantly in distal (left sided) colon, comparable with results from Asian and the Western countries[46,47]. Nonetheless, because of the significance of adenomatous polyps and hyperplastic polyps present in proximal colon, the location of polyps is not helpful for distinguishing between neoplastic and non-neoplastic polyps. So, complete colonoscopy is recommended in screening guidelines for colon cancer[43,48]. In addition, this study showed that only 56.6% of the polyps were found in the rectum and sigmoid region. Our study did not find any association between the age and location of polyps. This is in contrast with previous studies showing that the incidence of right sided polyps increased with increasing age[44].

With regard to the size of polyps, we observed that the hyperplastic polyps and tubular adenoma were always smaller than 10 mm, while tubulo-villous and villous adenoma were always bigger than 10 mm. So,

removing the polyps which are larger than 10 mm is recommended[36,49].

The study faced some limitations. First, this study was not population-based, therefore, the selection bias of the study population must be kept in mind. Second, our sample included mostly symptomatic patients, in which the estimates may be different from screening studies with asymptomatic individuals. Nevertheless, the results of this study can provide a good infrastructure for the next preventive program and have clinical implications for CRC screening.

In conclusion, PDR, ADR and CRC detection rate in this study were 23.5%, 12.8% and 1.5%, respectively. Most of the polyps and CRC were identified in patients aged 50 years or older. The majority of the polyps were adenomatous. More than 50% of the polyps were found in the rectosigmoid part of the colon. Finally, our study did not find any association between the family history and PDR.

COMMENTS

Background

Colorectal cancer (CRC) is the third most common malignant disease in both men and women worldwide, accounting for more than 8% of cancer-related death in the world with approximately 1.4 million new cases a year. Almost all CRCs develop from colorectal polyps. CRC largely can be prevented by the detection and removal of adenomatous polyps, and survival is significantly better when CRC is diagnosed while still localized. When CRC is found at an early stage before it has spread, the 5-year relative survival rate is about 90%. But only about 4 out of 10 CRCs are found at this early stage. When cancer has spread outside the colon or rectum, survival rates are lower.

Research frontiers

Early diagnosis and endoscopic resection of adenomatous polyps is the main approach for screening and prevention of CRC. This study aimed at identifying the prevalence, and clinical and pathologic characteristic of colonic polyps among Iranian patients undergoing a comprehensive colonoscopy and determine the polyp detection rate (PDR) and adenoma detection rate (ADR).

Innovations and breakthroughs

Only few studies are available in the national literature regarding the assessment of colorectal polyps, but none has explicitly noted the rate of polyp detection. Nevertheless, the study provides comprehensive information about clinical and epidemiological features of colorectal polyps.

Applications

Older age is the most important predictor for the prevalence of adenomas and cancer. Based on the results of this study, the PDR and cancer prevalence reached a peak in the 6th decade of life. Given the increased prevalence of CRC in the sixth decade of life, regular screening beginning at the age of 50 is the key to preventing CRC.

Terminology

The overall PDR was defined as the proportion of procedures in which at least one polyp was detected over the total number of colonoscopies. ADR was defined as the number of colonoscopies in which one or more adenomas was detected, divided by the total number of colonoscopies performed by the endoscopist.

Peer-review

Authors report in this paper the detection rates by colonoscopy for cancer and adenoma in an Iranian population.

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