Adenomatous colorectal polyps (ACPs) are common and known to be the precursor lesions for colorectal cancer (CRC). Removal of ACPs at colonoscopic screening significantly reduces the risk of CRC. Nowadays, many countries are not only adopting national CRC screening programs but are also seeking strategies to increase participation of eligible individuals in these programs. It is believed that a one-time screening colonoscopy at the age of 55 years could achieve a 30-50% reduction in mortality from CRC. Of note, the incidence of CRC has been declining in the United States due to widespread CRC screening and change in behavioral risk factors.

Despite Asian countries, including Kuwait, having lower rates of CRC as compared with Western countries, studies have shown that adoption of Western lifestyles, including dietary patterns, has led to a rapid transition towards Western rates; for that reason, screening for CRC has been enhanced as a national health priority in most Asian countries.

The characteristics of both patients and polyps can predict the risk of CRC developing in an adenoma. Meanwhile, the frequency and features of ACPs vary widely among different populations. Understanding the natural occurrence and the features of ACPs is crucial in any CRC prevention strategy. To date, limited data on this issue is available from Kuwait and the need for a national colonoscopy screening program has not yet been assessed. The aim of the study was to determine the prevalence, endoscopic and histological features of ACPs in patients referred for colonoscopy in a regional hospital in Kuwait.

**PATIENTS AND METHODS**

Endoscopic and histological reports of all adult patients who underwent complete colonoscopy up to the cecum (96% of all colonoscopies) using an Olympus colonoscope system (CF-Q 160 AL, Tokyo, Japan) in the Gastroenterology Unit of Farwaniya Hospital,
Kuwait (a 920-bed regional hospital), between January 2008 and December 2008 were retrospectively studied. Pertinent clinical data were extracted from the patients’ medical records. Variables like age, gender, nationality, indication for colonoscopy, past history of ACPs and the location, morphology and histological features of ACPs were retrieved and analyzed. Patients with incomplete colonoscopy due to any cause; and those with personal or family history of hereditary polyposis syndromes, CRC or inflammatory bowel disease were excluded. A total of 530 eligible patients were enrolled.

Study procedures

Procedures for performing colonoscopy and histological evaluation have been described elsewhere.[11] Colonoscopies were performed by four qualified gastroenterologists. Once the location and size of all visible polyps were identified, the polyps were removed and standard histological assessment was done in the local pathology lab. The location of ACPs was categorized as proximal or distal. Polyps at or distal to the splenic flexure were classified as distal polyps. The size of the polyp was estimated with the use of an open biopsy forceps. Specimens were reviewed by an experienced pathologist (A.A.) who was blinded to any clinical or endoscopic information of the patients. Advanced adenoma was defined as an adenoma that was ≥10 mm and/or was a villous adenoma (at least 25% villous) or an adenoma with high-grade dysplasia. Patients with a pathologic interpretation of intramucosal carcinoma or carcinoma in situ were classified in the high-grade dysplasia group. Cancer was defined as invasion of malignant cells beyond the muscularis mucosa. Patients were classified based on the most advanced lesion.[12]

Ethical consideration

The Standing Committee for Coordination of Health and Medical Research at the Ministry of Health, Kuwait, approved this study.

Statistical analysis

Statistical package for the social sciences (SPSS) for Windows (Version 16.0; SPSS Inc., Chicago, IL, USA) was used for analysis of data. Categorical variables were expressed as numbers and percentages. Chi-square or Fisher’s exact test, where appropriate, was used for analysis of categorical variables. Continuous variables were expressed as medians, or as means and standard deviation, as appropriate. Differences in means were compared using Student t test. Significant potential risk factors for CRC in univariate analysis were tested in a logistic regression model. All tests used were two-tailed. A P value <0.05 was considered statistically significant.

RESULTS

Demographic characteristics of the cohort of eligible patients

Of the 530 eligible patients (mean age, 44.8±14.3 years), 54 (10%) had 103 ACPs. Additional 13 (2.5%) patients had had non-neoplastic polyps and were not considered in the analysis. Two hundred sixty-seven (50%) patients were Kuwaitis (K): 187 were male (M), 80 were female (F) and 263 (50%) were of other nationalities (178, M; 85, F). The overall M-F ratio was about 2:1. There were no significant age or gender differences between Kuwaitis and non-Kuwaitis (NK) (P>0.05). ACPs were detected in 36 Kuwaiti patients (28M, 8F; 13% of Kuwaiti patients) and in 18 non-Kuwaiti patients (13M, 5F; 7% of non-Kuwaiti patients). The overall prevalence of ACPs among all males in the cohort irrespective of nationality was 11% (41/365); and among all females, 8% (13/165). The distribution of age, gender, nationality and occurrence of ACPs among all patients is shown in Table 1.

The site distribution of 103 ACPs among the affected 54 patients revealed that 62 were in distal colonic site and 41 in proximal colonic site. Concerning patients, 31 had 53 isolated distal polyps, 7 had concurrent 9 distal and 7 proximal polyps while 16 had 34 isolated proximal polyps. Table 2 shows site distribution, sizes and shapes of the 103 ACPs.

| Variable | Kuwait | Non-Kuwaiti |
|----------|--------|-------------|
| Age, years (mean±SD) | 46.3±15.7 | 43.3±12.5 |
| Gender | | |
| Male | 187 (35) | 28 (5) | 178 (34) | 13 (2) |
| Female | 80 (15) | 8 (2) | 85 (16) | 5 (1) |
| Total | 267 (50) | 36 (7) | 263 (50) | 18 (3) |

| Variable | Distribution of ACPs (no., %) |
|----------|-------------------------------|
| Distal colorectal position | 62 (60) |
| Proximal colonic position | 41 (40) |
| Shape (no., %) | |
| Sessile | 65 (63) |
| Pedunculated | 38 (37) |
| Size (no., %) | |
| 1-5 mm | 61 (59) |
| 6-9 mm | 31 (30) |
| 10 mm or more | 11 (11) |
| Size of polyps in mm, median (range) | 5 (2-25) |
| Number of polyps/patient, median (range) | 1 (1-12) |
**Demographic characteristics of patients with ACPs**

Of the 54 patients with ACPs, 43 (80%) were males and 36 (67%) were Kuwaitis. Their mean age (56.6 years ± 12.7) was significantly higher than that of those without ACPs (P=0.001). Past history of adenoma was reported in 8 (15%) patients. The most common indications for colonoscopy among those patients were abdominal pain, constipation and bleeding per rectum (39%). Table 3 summarizes the demographic characteristics and indications for referral in patients with ACPs.

**Size and histopathological types of the most significant ACPs**

In general, the size of the polyp ranged between 2 and 25 mm (median, 5 mm). A polyp size ≥10 mm was identified in 11 (20%) patients. Results of histopathological examination of the most significant polyp in each patient are shown in Table 4.

**Advanced ACPs**

Fifteen patients (2.8% of the entire cohort of patients) had advanced ACPs. There was no significant difference between patients with advanced ACPs and those without regarding nationality, gender, past history of adenoma, site distribution or indication for colonoscopy (P>0.05). However, a polyp size of ≥10 mm and patient age ≥40 years were significantly associated with advanced polyp pathology (P<0.001 and 0.006, respectively).

**Distribution of patients with ACPs in groups according to age**

The overall prevalence of the most significant and advanced ACPs increased significantly with age. The majority of patients with ACPs (41/54, 75.9%) had ages ≥50 years [Table 5].

**Variables and their association with ACPs**

Categorical data analysis showed that ACPs were significantly associated with Kuwaiti nationals (P=0.005) and past history of adenoma (P<0.001). Logistic regression analysis of some variables and their association with ACPs is shown in Table 6. Age (P<0.001; OR, 1.9; CI, 1.5-2.3), past history of adenoma (P=0.001; OR, 6.4; CI, 2.1-19.4) and being Kuwaiti nationals (P=0.029; OR, 2.1; CI, 1.1-4.1) were independently associated with ACPs.

**DISCUSSION**

This report is the first to address the profile of ACPs in a cohort of symptomatic adult patients in Kuwait. Despite being
a non-population-based study, significant data are presented. In our patients, the prevalence of ACPs was substantial among patients aged 50 years or more, and a considerable number of these patients had advanced adenoma.

The prevalence rates of ACPs vary considerably. An earlier study from Kuwait\(^{[13]}\) reported a prevalence of 4.6% for various types of colorectal polyps. In our study, the overall prevalence was comparatively higher. This might be attributed to higher mean age of our patients. Studies from different Asian countries on symptomatic patients showed a prevalence of 5.1% in India,\(^{[10]}\) 11.7% in Iran\(^{[14]}\) and 14.8% in 10 Asian countries according to reports from 17 endoscopy centers.\(^{[15]}\)

The variability in prevalence may be due to dissimilarity in indications for colonoscopy and in the proportion of patients who had high risk for ACPs, such as men, older patients, patients with positive fecal occult blood test and those with family history of CRC.\(^{[16-19]}\)

As reported in other studies,\(^{[14,20]}\) we did not find any significant association between the referring indication for colonoscopy and the detection of ACPs. However, in contrast to the notion that male gender predicts higher prevalence of adenoma,\(^{[21-23]}\) we found no significant gender-related association. This may be attributed to the relatively smaller number of females in this study. However, Bafandeh et al. similarly found no association between gender and occurrence of ACPs in symptomatic Iranians referred for colonoscopy.\(^{[14]}\)

A significant number of ACPs were proximally located. Advanced proximal neoplasia may be missed if screening is done only by sigmoidoscopy.\(^{[11,24,25]}\) In our study, proximal ACPs were detected more frequently in patients with distal ACPs than in those without distal ACPs, which is supported by a meta-analysis of screening colonoscopy studies.\(^{[26]}\)

In addition, no age or gender difference with regard to site distribution of overall and advanced ACPs was observed in our patients; this has been noted in other studies as well.\(^{[10,27]}\) However, Imperiale et al.\(^{[24]}\) and Lieberman et al.\(^{[12]}\) have observed that age is an important risk factor for all proximal neoplasias regardless of distal findings. In addition, Anderson et al.\(^{[28]}\) found male gender to be predictive of non-advanced proximal neoplasm.

Twenty-six percent of our patients with ACPs had villous component. In other studies, villous adenomas ranged from 10% to 38%.\(^{[10,29]}\) Villous polyps may become malignant in 29% to 70% of the cases.\(^{[30]}\)

The prevalence of advanced ACPs was slightly higher than that reported by Cheng et al.\(^{[18]}\) (1.5%) but much lower than that reported by Sung et al.\(^{[17]}\) (12.5%); and that reported by Lam et al. (33%),\(^{[31]}\) who reported a peculiarly increasing prevalence of advanced colonic polyps in young patients undergoing colonoscopy in Hong Kong. Advanced ACPs have been reported to develop into cancer and to be predictive, after removal, of future advanced neoplasia.\(^{[32]}\) In our study, large ACPs were more likely to demonstrate advanced pathology. However, carcinoma in situ and invasive cancers are sometimes found in small tubular adenomas (TA).\(^{[33]}\)

Increased polyp size, villous histology and severe dysplasia are all associated with an increased risk of malignancy in an adenoma. This risk is even greater for those who have multiple polyps.\(^{[34]}\) A total of 14 (26%) of our patients with ACPs had two or more polyps and thus carried high-risk adenomas. Additionally, and similar to other studies,\(^{[13-37]}\) it was found that the prevalence of overall and advanced adenomas increases substantially with advancing age, being more common over the age of 50 years.

Our study revealed a strong association between past history of colorectal adenomas and the adenoma detection on surveillance colonoscopy. Past history of adenoma increases the incidence of recurrent overall and advanced neoplasia.\(^{[28,32]}\) In addition, Kuwaiti nationals had almost 2-fold increased risk of ACPs when compared to non-Kuwaitis. The reasons for this higher risk are not clear. It is probable that higher exposure to western-type fatty diet and consequently higher incidence of obesity in Kuwaitis\(^{[38]}\) may be a contributory factor.

Although Kuwait is considered to be among the countries with low incidence of colorectal cancer, there has been an increasing trend in age-standardized rate (ASR) of colorectal cancer among Kuwaitis since 1988.\(^{[39]}\)

The last web-published data from the International Agency for Research on Cancer regarding cancer incidence in Kuwait showed ASR (per 100,000) during the period 1998-2002 for the colon and rectum cancers to be 8.4 and 5.2, respectively.\(^{[40]}\) Local unpublished data from the cancer registry in Kuwait has even shown further rise in ASR (per 100,000) of colon cancer to 9.2 among males and 9.5 among females.

It is relevant to mention that there is no screening program for CRC in Kuwait so far. Recommending a screening program requires population-based studies in asymptomatic average-risk individuals (aged ≥50 years), and its implementation will require strong collaboration between the primary health care sector and the specialized endoscopy centers.

Our study has certain limitations in that certain risk factors for ACPs like body mass index, smoking, alcohol and
dietary pattern were not studied because of the restrictions associated with the retrospective nature of the study.

In conclusion, the prevalence of overall and advanced ACPs in our patients was significant. Most of the significant polyps were identified in patients aged 50 years or older, had a tubular type in histology and a considerable proportion of them had advanced pathology. Advancing age, being Kuwaiti nationals and past history of ACPs were significantly associated with the occurrence of ACPs.

REFERENCES

1. Bond JH. Colon polyps and cancer. Endoscopy 2003;35:27-35.
2. Davila RE, Rajan E, Baron TH, Adler DG, Egan JV, Faigel DO, et al. Asge guideline: Colorectal cancer screening and surveillance. Gastrointest Endosc 2006;63:546-57.
3. Brawarsky P, Brooks DR, Mucci LA, Wood PA. Effect of physician recommendation and patient adherence on rates of colorectal cancer testing. Cancer Detect Prev 2004;28:260-8.
4. Frazier AL, Colditz GA, Fuchs CS, Kuntz KM. Cost-effectiveness of screening for colorectal cancer in the general population. JAMA 2000;284:1954-61.
5. Jemal A, Siegel R, Ward E, Hao Y, Xu J, Murray T, Thun MJ. Cancer statistics, 2008. CA Cancer J Clin 2008;58:71-96.
6. Sung JJ, Lau JY, Koh GL, Leung WK. Increasing incidence of colorectal cancer in asia: Implications for screening. Lancet Oncol 2005;6:871-8.
7. Yiu HY, Whittemore AS, Shibata A. Increasing colorectal cancer incidence rates in Japan. Int J Cancer 2004;109:777-81.
8. Sung JJ, Lau JY, Young GP, Sano Y, Chiu HM, Byeon JS, et al. Asia pacific consensus recommendations for colorectal cancer screening. Gut 2008;57:1166-76.
9. Pickhardt PJ. The natural history of colorectal polyps and masses: Rediscovered truths from the barium enema era. AJR Am J Roentgenol 2007;188:619-21.
10. Tony J, Harish K, Ramachandran TM, Sunilkumar K, Thomas V. Profile of colonic polyps in a southern indian population. Indian J Gastroenterol 2007;26:127-9.
11. Lieberman DA, Weiss DG, Bond JH, Ahnen DJ, Garewal H, Chejfec G. Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans affairs cooperative study group 380. N Engl J Med 2007;26:127-9.
12. Imperiale TF, Wagner DR, Lin CY, Larkin GN, Rogge JD, Ransohoff DF. Risk of advanced proximal neoplasms in asymptomatic adults according to the distal colorectal findings. N Engl J Med 2000;343:169-74.
13. Kadakia SC, Wrobleski CS, Kadakia AS, Meier NJ. Prevalence of proximal colorectal polyps in average-risk asymptomatic patients with negative fecal occult blood tests: Influence of age, gender, and family history. Am J Gastroenterol 1993;88:825-31.
14. Okamoto M, Shiratori Y, Yamaji Y, Kato J, Ikenoue T, Togo G, et al. Relationship between age and site of colorectal cancer based on colonoscopy findings. Gastrointest Endosc 2002;55:548-51.
15. Anderson JC, Alpern Z, Messina CR, Lane B, Hubbard P, Grimson R, et al. Predictors of proximal neoplasia in patients without distal adenomatous pathology. Am J Gastroenterol 2004;99:472-7.
16. Lewis JD, Ng K, Hung KE, Bilker WB, Berlin JA, Brensinger C, et al. Detection of proximal adenomatous polyps with screening sigmoidoscopy: A systematic review and meta-analysis of screening colonoscopy. Arch Intern Med 2003;163:413-20.
17. Soon MS, Kozarek RA, Ayub K, Soon A, Lin TY, Lin OS. Screening colonoscopy in chinese and western patients: A comparative study. Am J Gastroenterol 2005;100:2749-55.
18. Cheng TI, Wong JM, Hong CF, Cheng SH, Cheng TJ, Shieh MJ, et al. Colorectal cancer screening in asymptomatic adults: Comparison of colonoscopy, sigmoidoscopy and fecal occult blood tests. J Formos Med Assoc 2002;101:685-90.
19. Soon MS, Kozarek RA, Ayub K, Soon A, Lin TY, Lin OS. Screening colonoscopy in chinese and western patients: A comparative study. Am J Gastroenterol 2005;100:2749-55.
20. Ahmed S, Leslie A, Thaha MA, Carey FA, Steele RJ. Lower gastrointestinal symptoms are not predictive of colorectal neoplasia in a faecal occult blood screen-positive population. Br J Surg 2005;92:478-81.
21. Cannon-Albright LA, Skolnick MH, Bishop DT, Lee RG, Burt RW. Common inheritance of susceptibility to colonic adenomatous polyps and associated colorectal cancers. N Engl J Med 1988;319:533-7.
22. Johnson DA, Gurney MS, Volpe RJ, Jones DM, VanNess MM, Chobanian SJ, et al. A prospective study of the prevalence of colonic neoplasms in asymptomatic patients with an age-related risk. Am J Gastroenterol 1990;85:969-74.
23. Rex DK, Lehman GA, Ulbright TM, Smith JJ, Pound DC, Hawes RH, et al. Colonic neoplasia in asymptomatic persons with negative fecal occult blood tests: Influence of age, gender, and family history. Am J Gastroenterol 1993;88:825-31.
24. Imperiale TF, Wagner DR, Lin CY, Larkin GN, Rogge JD, Ransohoff DF. Using risk for advanced proximal colonic neoplasia to tailor endoscopic screening for colorectal cancer. Ann Intern Med 2003;139:959-65.
25. Lewis JD, Ng K, Hung KE, Bilker WB, Berlin JA, Brensinger C, et al. Detection of proximal adenomatous polyps with screening sigmoidoscopy: A systematic review and meta-analysis of screening colonoscopy. Arch Intern Med 2003;163:413-20.
26. Okamoto M, Shiratori Y, Yamaji Y, Kato J, Ikenoue T, Togo G, et al. Relationship between age and site of colorectal cancer based on colonoscopy findings. Gastrointest Endosc 2002;55:548-51.
27. Anderson JC, Alpern Z, Messina CR, Lane B, Hubbard P, Grimson R, et al. Predictors of proximal neoplasia in patients without distal adenomatous pathology. Am J Gastroenterol 2004;99:472-7.
28. Kadakia SC, Wrobleski CS, Kadakia AS, Meier NJ. Prevalence of proximal colorectal polyps in average-risk asymptomatic patients with negative fecal occult blood tests and flexible sigmoidoscopy. Gastrointest Endosc 1996;44:112-7.
29. Loy TS, Kaplan PA. Villous adenocarcinoma of the colon and rectum: A clinicopathologic study of 36 cases. Am J Surg Pathol 2004;28:1460-5.
30. Lam TJ, Wong BC, Mulder CJ, Pena AS, Hui WM, Lam SK, et al. Increasing prevalence of advanced colonic polyps in young patients undergoing colonoscopy in a referral academic hospital in hong kong. World J Gastroenterol 2007;13:3873-7.
31. van Stolk RU, Beck GJ, Baron JA, Haile R, Summers R. Adenoma characteristics at first colonoscopy as predictors of adenoma recurrence and characteristics at follow-up. The polyp prevention study group. Gastroenterology 1998;115:13-8.
32. Read TE, Read JD. Butterfly LF. Importance of adenomas 5 mm or less in diameter that are detected by sigmoidoscopy. N Engl J Med 1997;336:8-12.
33. Laiyemo AO, Murphy G, Albert PS, Sansbury LB, Wang Z, Cross AJ, et al. Postpolypectomy colonoscopy surveillance guidelines: Predictive accuracy for advanced adenoma at 4 years. Ann Intern Med 2008;148:419-26.
34. Chiu HM, Wang HP, Lee YC, Huang SP, Lai YP, Shun CT, et al. A prospective study of the frequency and the topographical distribution of colon...
neoplasia in asymptomatic average-risk Chinese adults as determined by colonoscopic screening. Gastrointest Endosc 2005;61:547-53.

36. O’Brien MJ, Winawer SJ, Zauber AG, Gottlieb LS, Sternberg SS, Diaz B, et al. The national polyp study. Patient and polyp characteristics associated with high-grade dysplasia in colorectal adenomas. Gastroenterology 1990;98:371-9.

37. Rundle AG, Lebwohl B, Vogel R, Levine S, Neugut AI. Colonoscopic screening in average-risk individuals ages 40 to 49 vs 50 to 59 years. Gastroenterology 2008;134:1311-5.

38. Al-Isa AN. Are Kuwaitis getting fatter? Nutr Health 2003;17:185-97.

39. Yako-Suketomo H, Marugame T. Comparison of time trends in colon, rectum and anus cancer incidence (1973-2002) in Asia, from ‘cancer incidence in five continents, vols iv-ix’. Jpn J Clin Oncol 2009;39:196-8.

40. Al-Hattab O, El-Basmy A, Al-Asfour A. Cancer incidence in Kuwait (1998-2002). In: Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, Boyle P, eds. Cancer Incidence in Five Continents, Vol. IX. IARC Scientific Publications No. 160, Lyon, IARC 2007. Available from: http://www-dep.iarc.fr/ [last accessed on 1.4.2009].

**Source of Support:** Nil. **Conflict of Interest:** None declared.