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Prevalence of colorectal polyps in pediatric colonoscopy

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Abstract

Background—The available data regarding the prevalence, types, and clinical determinants of colonic polyps in children is limited.

Aims—We aimed to estimate the prevalence of colorectal polyps in a large cohort of children.

Methods—We conducted a cross-sectional study to determine the presence, number, and location of colorectal polyps reported in all children (0–20 years) who underwent colonoscopy at 14 pediatric facilities between January 2000 and December 2007 recorded in Pediatric Endoscopy Database System Clinical Outcomes Research Initiative (PEDS-CORI). We compared procedures with and without polyps with respect to procedure indication, age, sex, and race. We also reviewed a sample of histopathologic reports from one participating center.

Results—We analyzed 13,115 colonoscopy procedures performed in 11,637 patients. Colorectal polyps were reported in 810 procedures (6.1%; 95% CI: 5.7% to 6.5%) performed in 705 patients, and in 12% of patients with lower GI bleeding. Children with colorectal polyps were significantly younger (8.9y vs. 11.9y; $p<0.0001$), male (58.3% vs. 49.0%; $p<0.001$), non-white race (27.5% vs. 21.9%; $p<0.001$), and had lower GI bleeding (54.4% vs. 26.6%; $p<0.001$) as compared to children without polyps. In a sample of 122 patients with polyps from a single center, the histological types were solitary juvenile in 91 (70.5%), multiple juvenile in 20 (15.5%), adenoma in 14 (10.9%) and hyperplastic polyps in 4 patients (3.1%).

Conclusions—Colorectal polyps are detected in 6.1% overall and in 12.0% among those with lower gastrointestinal bleeding during pediatric colonoscopy. Approximately 26% are multiple juvenile or adenoma.

Keywords

colonic polyps; hematochezia; colonoscopy

Introduction

The significance of colorectal polyps has been extensively examined in adults and colonoscopy screening for polyps has become the most common endoscopic procedure. In children, colorectal polyps also have the potential for malignant change and colonoscopy is often performed to evaluate for suspected polyps.^{1,2} However, the available evidence regarding the prevalence, type, and significance of colonic polyps in children is limited.

The pediatric literature demonstrates a wide variation in reported prevalence of polyps in children undergoing endoscopy. The largest study reported polyps in 184 patients (8.7%) of 2,117 who underwent colonoscopy over a 9 year period at a single referral center in the USA.³ The second largest study was conducted in France and included 1533 colonoscopies performed between January 1974 and April 1988.⁴ This study reported polyps in 183 children (12%) under the age of 15. Histological examination of 129 polyps revealed a juvenile polyp in 125 cases, an hyperplastic polyp in 2 cases, a lymphoid polyp in 1 case and an adenoma in 1 case.⁴ Latt et al performed a 10-year audit of colonoscopies done in the UK and reported 29 polyps found in 730 colonoscopies (4%).⁵ Several other studies reported polyp prevalence (Table 1) in pediatric colonoscopy, but the majority of these studies examined a small number of procedures in selected patients (i.e., children with rectal bleeding).

Having precise estimates for the prevalence of colorectal polyps in children may lead to increased understanding of the significance and long-term implications of polyps. There is a lack of systematic, multicenter studies in the pediatric population. Therefore, we conducted the current study to examine the frequency, type, and clinical determinants of polyps encountered during pediatric colonoscopy performed in 14 centers utilizing the PEDS-CORI endoscopy database.

Methods

Endoscopy Database

Pediatric Endoscopy Database System—Clinical Outcomes Research Initiative (PEDS-CORI), the pediatric component of the endoscopic database CORI, was created in November 1999.⁶ Participating sites in PEDS-CORI agree to use a structured, computerized report generator to produce all endoscopic reports and comply with quality control requirements. Physicians are asked to provide detailed descriptions of every polyp, including size, location, morphology (pedunculated, sessile, or flat), and method of removal. Reports from each site get transmitted electronically to a central data repository and are merged for analysis. The data that is transmitted from the local site to the National Endoscopic Database does not contain most patient or provider identifiers and qualifies as a Limited Data Set.

During the study period, there were 14 active PEDS-CORI sites that consistently met quality standards. All participating PEDS-CORI sites have waiver of consent approval via the institutional review board at each site. The 14 sites were: Texas Children's Hospital (Houston, TX), Children's Healthcare of Atlanta at Egleston (Atlanta, GA), Doernbecher Children's Hospital (Portland, OR), Children's Healthcare of Atlanta (Scottish Rite), Children's Hospital of Buffalo (Buffalo, NY), Phoenix Children's Hospital (Phoenix, AZ), Children's Hospital of The King's Daughters (Norfolk, VA), Maine Medical Center (Portland, ME), Children's Hospital of Wisconsin (Milwaukee, WI), Scott & White Memorial Hospital (Temple, TX), Nemours Children's Hospital (Orlando, FL), University of Kentucky Children's Hospital (Lexington, KY), children's Hospital of Philadelphia (Philadelphia, PA), and Children's Hospital of Columbus (Columbus, OH).

Study Design and Procedures

This is a cross-sectional study of colonoscopy information compiled from 1/1/2000 through 12/31/2007 in PEDS-CORI on patients aged 0–20 years. For each colonoscopy included in the study, we also collected demographic characteristics (sex, age, race/ethnicity), primary indication for the colonoscopy, ASA (American Society of Anesthesiologists) class, and type of anesthesia. We excluded incomplete procedures and duplicate procedures.

We identified colonoscopies with colorectal polyps and compared them to the rest of colonoscopies without polyps with respect to procedure indication, gender, age, and race. We also compiled the number, size, and distribution of polyps seen during colonoscopy. We performed a chart review of available histopathologic records at our institution (Texas Children's Hospital). We categorized the types of polyps as juvenile, adenoma, hyperplastic, hamartomas, or other polyposis syndrome (i.e., Peutz-Jeghers).

Statistical Analysis

Chi-square tests were used to compare the distribution of categorical variables describing patient demographics (e.g., gender) and procedure indication among procedures with and without any polyps. The relationship between ordered variables (e.g. age, ASA class) and the presence of polyps was analyzed with the Mantel-Haenszel test of trend. The polyp prevalence and 95% confidence intervals were calculated among unique patients undergoing colonoscopy. All analyses were performed by using SAS software (SAS Institute, Inc., Cary, NC).

Results

During the study period, 13,279 colonoscopies were recorded at 14 PEDS-CORI sites, and 164 (1.2%) were excluded for incomplete procedure notes, duplicate records, or patient age greater than 20 years. Thus, a total of 13,115 colonoscopy procedures performed on 11,637 patients between 1/1/2000 and 12/31/2007 were included in the analysis. The most common primary indications for colonoscopy were lower gastrointestinal bleeding (28.3%), abdominal pain or bloating (19.8%), diarrhea (14.8%) and inflammatory bowel disease (8.4%). The mean age for these patients was 11.7 years (standard deviation 4.7). Race was described as white in 76.8%, black in 11.2%, Hispanic in 7.6% and Asian in 1.5%. Approximately half of the procedures (49.8%) were conducted in female patients. Among the procedures included, 8,550 (64%) were performed under general anesthesia, and 4,729 (36%) were done under intravenous sedation.

There were 810 of 13,115 procedures (6.1%; 95% CI: 5.7–6.5) in 705 patients with at least one recorded colorectal polyp. Among procedures with polyps, 575 (71%) reported a single polyp while only 235 (29%) reported multiple polyps. Among solitary polyps, the most common location of polyps was the sigmoid colon (184, 32.0%), followed by rectum (178, 31.0%), cecum (66, 11.5%), and the descending colon (42, 7.3% of those with a polyp). A pedunculated attachment was reported in 409 (50.1%) polyps, while 192 (23.7%) were reported as sessile. In the 705 unique patients with polyps, 502 (71%) were reported to have single polyps and 203 (29%) had multiple polyps. The most frequent primary indication for repeat procedures ($n = 105$) included 24 (22.9%) for lower gastrointestinal bleeding, 18 (17.1%) for surveillance, and 17 (16.2%) for polyp seen on prior colonoscopy.

Patients with and without any colorectal polyps were compared with regards to demographic and clinical features (Table 2). Overall, patients with polyps were younger (8.9 years vs. 11.9 years) and were more likely to be male (58% vs. 41%) patients. Patients with polyps were also more likely to have an ASA I class compared to patients with no polyps. Non-Caucasian races were associated with significantly higher risk of having polyps as compared

to Caucasians (72.5% vs. 27.5%; $p<0.001$). Specifically, both Blacks (8.4%, $p<0.001$) and Hispanics (7.8%, $p = 0.01$) had a higher prevalence of polyps than Caucasians (5.8%). Lower GI bleeding was the most frequent indication for colonoscopy in children with polyps, more than twice as common as compared to those without polyps (54.4% vs. 26.6%; $p<0.001$).

We reviewed histopathologic records of polyps detected in colonoscopies performed between March 10, 2003 and December 30, 2007 at Texas Children's Hospital. During this time period, 2,083 colonoscopies were performed in 1849 patients. There were 129 procedures (6.2%; 95% CI: 5.2 – 7.3) in 122 patients that reported at least one polyp that was removed or biopsied. The race of these patients was described as white in 55.7% ($n=68$), black in 17.2% ($n=21$), Hispanic in 22.1% ($n=27$) and Asian in 3.3% ($n=4$). The mean age for these patients was 8.3 years (standard deviation 4.6). Female patients accounted for 37% ($n=46$) of patients. The histological types reported were solitary juvenile in 91 (70.5%) patients, multiple juvenile in 20 (15.5%), adenoma in 14 (10.9%) and hyperplastic polyps in 4 (3.1%) patients. Patients with juvenile polyps were significantly younger than those with adenomas (7.6 y vs 12.9 y, $p<0.01$). Patients with solitary juvenile polyps were significantly younger than those with multiple juvenile polyps (7.3 y vs 9.5 y, $p=0.03$).

Discussion

We found that the prevalence of colorectal polyps in a pediatric population undergoing colonoscopy is approximately 6.1%. Lower GI Bleeding was the most frequent indication for colonoscopy in children with polyps; polyp prevalence was approximately 12% in children with lower GI bleeding. We also found that children with polyps reported were younger and were more likely to be male and of non-Caucasian races (e.g., black, Hispanic).

The prevalence of polyps in this study is similar to rates (4–12%)^{3–5} found in other studies examining consecutive patients referred to colonoscopy irrespective of indication and lower than rates reported in studies of selected patients with lower GI bleeding (Table 1). These discrepancies in reported polyp prevalence highlight the influence of selection bias. Given the large sample, multiple centers involved, and the enrollment of unselected patients, we believe that the prevalence rates in this study provide the most representative estimates of polyps in community practice.

In our study, male gender and minority race were risk factors for polyps. Although many adult studies were performed in asymptomatic patients, adult data also shows male gender and minority race as risk factors for hyperplastic and adenomatous polyps^{7,8,9,10}. Previous data in children has shown that male patients are at increased risk for polyps.^{3,4,11} For example, in one large series examining childhood polyps in the USA, juvenile polyps were twice as likely in male patients undergoing colonoscopy.³ Adult data utilizing the CORI database has shown an increased prevalence of colon polyps in blacks as compared to whites.⁸ Adult studies conducted in Hispanic populations also confirm the higher risk in minority groups.¹⁰ However, racial disparities in polyp prevalence have not been previously investigated in pediatrics. The reasons for sex and race related differences in polyp prevalence in children are unknown.

Colorectal adenomas are known to be precursors of sporadic and hereditary colorectal cancer.¹² The prevalence of adenomatous colorectal polyps in this study is not negligible. Histological examination in 141 cases revealed adenomas in 14 (11%) or an overall prevalence of 0.8% (14/1849). Previous pediatric studies reported variable prevalence for polyps with adenomatous changes.^{4,5,13,14} For example, Gupta et al examined polyps

encountered in 195 colonoscopies performed in a tertiary referral center in the USA and found adenomatous changes in only one patient.^{3,11} In a 10-year audit of 730 colonoscopies, Latt et al. also found one adenomatous polyp.⁵ On the other hand, Cynamon et al. reported a similar estimate in finding adenomas in 8% of 41 children with polyps in a referral center in the USA.¹⁵ Furthermore, a report out of India also showed adenomatous changes in 11% (17/152) of children with polyps.¹¹

Hyperplastic polyps are the most common (20–40%) type of colorectal polyp in adults, and were encountered in 3.1% of polyps reviewed in our sample.¹⁶ Hyperplastic polyps have traditionally been considered to be benign lesions which do not require surveillance, similar to solitary juvenile polyps in children. However, several preliminary studies in adults indicate that hyperplastic polyps with serrated pathology may act as a marker for future adenomas or a precursor to colorectal cancer.^{9,17,18,19,20} Solitary juvenile polyps are considered benign, whereas the multiple juvenile polyps are associated with increased risk of colorectal cancer.²¹ Three or more juvenile polyps or any number of polyps occurring in the context of a family history of juvenile polyposis or colon cancer have been proposed as a criterion for a increased risk of colon neoplasia in children.²² However, the precise number of polyps that increases cancer risk is unknown.^{22,23,24} Despite the generally benign nature of juvenile polyps, endoscopic removal is recommended. There are reports of rare neoplasia in patients with solitary juvenile polyps and it is unclear which patients with juvenile polyps may develop malignancy.^{1,22,25,26} A review by Mestre concluded that there is a 3–5% chance that a single juvenile polyp may have adenomatous features.²⁷ Additionally, a recent chart review of 257 patients with colonic juvenile polyps concluded that recurrent polyp formation is common in children with juvenile polyps.²⁸ These data challenge the current practice of repeating endoscopy only in children with multiple polyps on initial colonoscopy.

Our findings reflect polyps identified by endoscopists without histopathologic confirmation, and therefore the overall prevalence of polyps may be overestimated. Generally, pediatric gastroenterologists do not use standardized systems for reporting endoscopic findings during colonoscopy. Therefore, the accuracy of the data depends upon the degree of completion and validity of the physician's documentation. Although our review of histopathology included only one center, the prevalence of histologically confirmed polyps from one study site was very similar to the overall prevalence.

The strengths of our study include the large number of procedures examined during several years, the multi-center structure of the database, and the availability of a large sample of histopathology reports. Since the data are generally entered immediately after the procedure is complete, the study was less susceptible to poor documentation. The data obtained from PEDS-CORI also serves as the endoscopy report for the patient's medical record, providing an incentive for accuracy and completeness.

In conclusion, colorectal polyps are reported in approximately 6% of colonoscopies in children. Polyps are strongly associated with lower gastrointestinal bleeding. Although solitary juvenile polyps are the most common type, up to 26% of patients may have multiple juvenile or adenomatous polyps.

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Table 1

Reported prevalence of polyps in children undergoing endoscopy arranged by sample size in descending order of number of procedures

Author, year	Country	Consecutive Unselected patients	Number of procedures	Polyp prevalence (%)	95% Confidence interval (%)
Gupta, 2001	USA	Yes	2,117	8.7	7.5–9.9
Mougenot, 1989	France	Yes	1,533	11.9	10.3–13.6
Latt, 1993	UK	Yes	730	4.0	2.7–5.6
Poddar, 1998	India	No	459	51.4	46.8–56.0
Clarke, 2005	Ireland	No	314	9.6	6.7–13.2
Cynamon, 1989	USA	No	234	17.5	13.0–22.8
Mandhan, 2004	Pakistan	No	229	67.7	61.4–73.5
Cucchiara, 1983	Italy	No	103	65.0	55.5–73.8
Balkan, 1998	Turkey	No	100	32.0	23.4–41.6
Jalihal, 1992	India	No	74	96.0	89.4–98.9
Perisic, 1987	Yugoslavia	No	71	63.4	51.7–73.9
Bartnik, 1986	Poland	No	48	87.5	75.8–94.8
Euler, 1981	USA	No	43	88.4	76.1–95.6
Deste, 1987	Italy	No	23	43.5	24.6–63.9

Table 2

Comparison of Colonoscopy Procedures with and without a Polyp Reported in 11,637 Pediatric Patients Undergoing Colonoscopy between 1/1/00 to 12/31/07 in 14 Sites of the PEDS-CORI Registry

Variable	No polyp		Polyp		p-value
Total	12,305	810			
	N	% of total	N	% of total	
Age Group					
0–5 years old	1491	12.12%	236	29.14%	<0.001
6–10 years old	3032	24.64%	291	35.93%	
11–14 years old	3821	31.05%	157	19.38%	
15–17 years old	3494	28.39%	110	13.58%	
18–20 years old	467	3.80%	16	1.98%	
Gender					
Female	6275	51.00%	338	41.73%	<.0001
Male	6030	49.00%	472	58.27%	
ASA Level					
Unknown	1399	11.37%	97	11.98%	<.0001
I	6566	53.36%	493	60.86%	
II	3867	31.43%	208	25.68%	
III	443	3.60%	12	1.48%	
IV	30	0.24%	0	0.00%	
Race/Ethnicity					
White Non-Hispanic	9608	78.08%	587	72.47%	<.0001
Black Non-Hispanic	1360	11.05%	124	15.31%	
Hispanic	926	7.53%	78	9.63%	
Asian	187	1.52%	13	1.60%	
Indication					
Abdominal Pain/Bloating	2564	20.8%	29	3.6%	
Diarrhea	1930	15.7%	13	1.6%	
Constipation	143	1.2%	2	0.3%	
Weight Loss	427	3.5%	5	0.6%	
Anemia	155	1.3%	10	1.2%	

Variable	No polyp	Polyp	p-value
Positive FOBT	34	4	0.5%
Lower GI Bleed *	3274	441	54.4%
Graft vs Host Disease	31	0	0%
Inflammatory Bowel Disease	1098	9	1.1%
Polyp seen on: Colonoscopy	24	35	4.3%
Family history of polyps	12	20	2.5%
Surv. of adenomatous polyp(s)	19	36	4.4%
Surv. Of Crohn's	495	5	0.6%
Surv. of Ulcerative Colitis	199	8	1.0%

* Lower GI Bleed includes hematochezia and melena