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Original Article

Quality of Colonoscopy, Characteristics of Polyps/Adenomas and Adenoma Detection Rate: A Cross Sectional Study

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ABSTRACT

Objective: To evaluate the quality of colonoscopy procedure and assess characteristics of polyps/adenomas and their detection rate.

Study Design: Cross Sectional Study.

Place and Duration of Study: Department of Gastroenterology, Combined Military Hospital, Rawalpindi Pakistan, from Jan 22 to Dec 23.

Methodology: Patients aged 15 to 92 years were included through non-probability consecutive sampling in which 387 colonoscopies were performed. Quality metrics addressed included indication, bowel preparation, caecal intubation rate, withdrawal time, polyp/adenoma detection rate and adverse events. Polyp/adenoma characteristics included site, morphology, size and histology-dysplasia. Results were analyzed using SPSS.

Results: Out of 387 colonoscopies, bowel preparation was adequate in 80.6% and caecal intubation rate was 85.3%. The overall polyp detection rate (PDR) was 21.2% and adenoma detection rate (ADR) was 9.3%. The PDR and ADR in patients > 50 years old were 23.7%, and 13.9%. ADR in patients >50 years old was statistically significant (p<0.001). Bowel preparation also showed significance with PDR (p=0.041) and ADR (p=0.025). There was no significant difference of PDR in patients >50 years old and PDR/ADR with gender. The most common polyp morphology was sessile 0-Is 64.6%. Polyps of size ≥10 mm, 13.3% were more likely to be adenomas and harbor higher grade dysplasia (p<0.001).

Conclusion: PDR and ADR increase with better preparation. Increase in polyp size was associated with adenomas of advanced features. The quality indicators of colonoscopy, PDR and ADR merit further evaluation large scale multicenter validation studies are needed to define baseline characteristics and PDR, ADR in our population.

Keywords: Adenoma detection rate, Bowel preparation, Colonoscopy, Polyp detection rate, Polyp morphology, Quality indicators.

How to Cite This Article: *Ashraf S, Siddiqi FA, Hassan F, Safdar L, Khan I, Khattak AL. Quality of Colonoscopy, Characteristics of Polyps/Adenomas and Adenoma Detection Rate: A Cross Sectional Study. Pak Armed Forces Med J 2026; 76(1): 63-68. DOI: https://doi.org/10.51253/pafmj.v76i1.12788*

INTRODUCTION

Colonoscopy introduced in late sixties as a purely diagnostic procedure, has evolved into the main diagnostic and therapeutic modality for the diseases of the colon.[1] Colon cancer is the third most common cancer worldwide and the second leading cause of death.[2] In Pakistan Colorectal cancer (CRC) is also the third leading cancer diagnosis (4.9%) after breast and oral cavity cancer.[3]

According to American Society of Gastrointestinal Endoscopy (ASGE), American Gastroenterological association (AGA), and European Society of Gastrointestinal Endoscopy (ESGE), efficacy of colonoscopy depends on high quality procedure, the parameters include explicit indication, first rate bowel preparation (to permit identification of mucosal lesions, adenoma/polyp details), identification of caecal anatomical landmarks, adenoma or broadly polyp detection rate, appropriate withdrawal time and proper documentation of procedure including those of adverse events, if any.[4-6]

A good bowel preparation is the first attribute of a high grade colonoscopy; because other performance measures namely the identification of lesions, adenomas/polyps and caecal intubation rate are directly dependent on this parameter 4-6. Suboptimal preparation results in inconvenience, impairs morphological identification of lesions and may require repeat examination.

The majority of colorectal cancer arise from adenomas; the process often takes up to a decade. Colonoscopy is considered the gold standard for the detection of adenomas and the only procedure that permits their removal. In a large scale randomized trial, the risk of colon cancer at 10 years in the non-screening group was 1.20%, screening with colonoscopy group the risk was 0.98% a relative

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Received: 03 Nov 2024; revision received: 05 Apr 2025; accepted: 10 Apr 2025

reduction of 18%. The authors estimated that 455 colonoscopies were required to prevent 1 cancer related death.[7]

Adenoma detection rate (ADR) is defined as the percentage of screening colonoscopies in which adenomas are detected. It has been reported in a study of 314,872 colonoscopies that 1% increase in ADR was associated with a 3% decrease in the risk of post colonoscopy colorectal cancer and 5% decrease in risk of fatal interval colorectal cancer.[8] ASGE, AGA and ESGE recommend that endoscopists achieve an overall ADR of 25% or more 4-6. However according to British Society of Gastroenterology (BSG) the minimum ADR should be 15% with an aspirational target of >20%.[9]

There have been very few studies in Pakistan regarding the ADR/identification of adenomas in colon.[10] The present study was undertaken to study the ADR in our set up, as well as polyp detection rate (PDR) and the quality indicators of colonoscopy that influence these.

METHODOLOGY

This cross sectional study was carried out from Jan 22 to Dec 23 at the Department of Gastroenterology CMH Rawalpindi, Pakistan. Patients aged 15 years or older were included in the study through non-probability consecutive sampling. For a 95% confidence interval with 5% margin of error and estimated proportion of 0.5, a hypothetical sample size of 384 was required using online calculator. Two gastroenterologists performed the procedure, each with 1000 and more than 1000 colonoscopies. The study was approved by the Hospital Ethics Committee (letter no 708 dated 28 Oct 24).

Inclusion Criteria: All patients greater than 18 years of age undergoing colonoscopy for screening or diagnostic indications with adequate bowel preparation, complete examination and visualization up to cecum were included.

Exclusion Criteria: Patients less than 18 years, patients with previously diagnosed colonic cancers, inflammatory bowel disease, prior colorectal surgery, sigmoidoscopy, ileoscopy, familial adenomatous polyposis and with incomplete data were excluded from the final analysis.

All patients undergoing colonoscopies had written informed consent. The preparation consisted of clear fluid diet a day before and on the morning of procedure. Patients were given polyethylene glycol (Movcol® sachets 13.7 gm) which included polyethylene glycol, sodium chloride, sodium bicarbonate and potassium chloride. Between, 12 – 24 sachets were advised in a split dose regimen to be taken with 1-2 L of water/clear fluids day before and on the morning of procedure. The preparation also included Kleen® (sodium biphosphate/sodium phosphate) enema day before and on the morning of procedure.

Patients were given conscious sedation of intravenous Midazolam 1-4 mg and Nalbuphine 0.5 to 2 mg. A very small percentage was given monitored anaesthesia care (0.8%) and general anaesthesia (0.8%) each. The bowel preparation was rated according to the Aronchick scale as (adequate, fair and inadequate). Aronchick rating of excellent and good was combined into one group adequate, fair and inadequate remained the same. It was classified into three groups for ease of agreement between colonoscopists. Later in the study Boston Bowel Preparation Scale with numerical rating was also used, but not included in the analysis. The other scales are Ottawa and Harefield Cleansing Scale.[11] The caecal landmarks identified were bilobed ileocecal valve, appendicular opening and triradiate caecal fold. A predesigned proforma was used to endorse variables such as demographic data, colonoscopy indication, sedation, bowel preparation, findings, biopsy, histopathology reports and any adverse events.

Statistical analysis was carried out with Statistical Package for the Social Sciences (SPSS), version 23. The continuous data was reported as Mean±SD. The categorical data was noted as frequency and percentages. Chi-square test and Fisher's exact test were used for association between categorical variables. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 387 colonoscopies were performed. The patients' ages ranged from 15 to 92 years with a mean of 52.59+18.20 years. There were 236(61%) patients aged 50 years and older and 151(39%) were less than 50 years. There were 251(64.9%) males and 136 (35.1%) females Table-I.

Othersa: Painful defaecation, abdominal lump, raised CEA, passage of mucus, bowel obstruction.

Miscellaneousb: Angiodysplasias, Diversion colitis, Radiation proctitis, GVHD, Colonic ulcer,

Neuroendocrine tumor, Eosinophilic colitis, Colonic stricture -diaphragm like

The main indications were lower GI bleed – fresh 111(28.7%), anaemia 32(8.3%) and thickening on CT scan 31(8.0%) Table-I. Midazolam and Nalbuphine were the drugs used to give sedation in 381(98.4%) patients with 3(0.8%) patients being given monitored anaesthesia care and 3(0.8%) patients general anaesthesia each. The bowel preparation was adequate in 312(80.6%), fair in 20(5.2%) and inadequate in 55(14.2%) patients. The withdrawal time was more than 8 minutes in 325(84.0%), and the caecal intubation rate was 330(85.3%). Endoscopic diagnoses were haemorrhoids 102(26.4%), normal colonoscopy 99(25.6%), polyps 82(21.2%) and ulcerative colitis 32(8.3%) Table-I.

Table–I: Patient Demographic and Colonoscopy Characteristics (n=387)

Characteristic	Values
Mean Age+SD (years)	52.6+18.2
50 years or more	236(61.0%)
Less than 50 years	151(39.0%)
Gender	
Male	251(64.9%)
Female	136(35.1%)
Socioeconomic status	
Low	82(21.2%)
Middle	265(68.5%)
High	40(10.3%)
Preparation	
Adequate	312(80.6%)
Fair	20(5.2%)
Inadequate	55(14.2%)
Polyps	
Polyp detection rate (Overall)	82(21.2%)
Non-adenomatous polyps	46(11.9%)
Adenoma Detection Rate (Overall)	36(9.3%)
Withdrawal time	
More than 10 mins	1(0.3%)
More than 8 mins	324(83.7%)
Less than 8 mins	62(16.0%)
Indications	
Lower GI bleed fresh	111(28.7%)
Anaemia	32(8.3%)
Thickening on CT Scan	31(8.0%)
Constipation	30(7.8%)
Screening	29(7.5%)
Lower GI bleed (altered blood)	22(5.7%)
Diarrhea	22(5.7%)
Pain abdomen	16(4.1%)
Weight loss	13(3.4%)
Othersa	20.8
Diagnoses	
Haemorrhoids	102(26.4%)
Normal colonoscopy	99(25.6%)
Polyps	82(21.2%)
Colon-Rectal cancer	43(11.1%)
Ulcerative colitis	32(8.3%)
Diverticulosis	23(5.9%)
Miscellaneousb	21(5.4%)
SRUS	14(3.6%)
Crohn's disease	6(1.6%)
IBD – U (Unclassified)	5(1.5%)

The polyp detection rate was overall 82(21.2%). Of polyps, 46(11.9%) were non-adenomatous (hyperplastic, inflammatory and retention) polyps. The adenoma detection rate overall (tubular, tubulovillous and villous adenomas) was 36(9.3%), Table-I. In patients 50 years or older, the PDR was 56(23.7%), and ADR was 33(13.9%). ADR in patients > 50 years old was statistically significant ($p< 0.001$) but not PDR ($p=0.126$). Bowel preparation also showed significance with PDR ($p=0.041$) and ADR ($p=0.025$).

There was no significant difference of genders with PDR ($p=0.758$) and ADR ($p=0.389$). PDR has shown significance with socioeconomic status but not ADR (Table-II).

The major sites for polyps were sigmoid colon 27(32.9%), rectum 25(30.5%). The most common polyp morphology was sessile 0-Is 53/82(64.6%), and least common was semi pedunculated 0-Isp 8/82(9.8%) Table-III.

Polyps of size ≥10 mm 13.3% were more likely to be adenomas and harbor advanced components, tubulovillous/villous histology and high grade dysplasia ($p<0.001$) table IV and V. No major complication was observed, however minor adverse events included: abdominal distention (post procedure) 14.5%, and during the procedure: hypotension 5.4%, bradycardia 4.9%, hypoxemia 4.4%, and post polypectomy minor bleed was 1.6%, which was controlled locally.

DISCUSSION

In the colonoscopy quality measures, the ADR stands out. This important parameter is associated with the development of interval colon cancer.[11] The other traditional quality measures like adequate bowel preparation, caecal intubation rate and withdrawal time though helpful are complementary. Our study is one of the very few local studies that addresses the quality of colonoscopic procedures, and the polyp/ adenoma detection rate (PDR/ADR) in our population.[12,13]

In the study the overall PDR was 21.3% and the ADR was 9.4%. The ADR in patients 50 years and older was 13.9%. In western literature4-6, ADR of more than 25% is recommended in patients 50 years or older. The results of this study are in line with local literature which report similar PDRs and ADRs. Yousuf *et al.*,[10] showed that in patients more than 50 years PDR was 24.8% and ADR was 15%. In the study by Hussain *et al.*, the advanced adenoma rate in

Table-II: Association of Polyp Detection Rate, Non Adenomatous Polyp, Adenoma Detection Rate with Patient Demographics and Colonoscopy Preparation

Variable	Total 387 n(%)	PDR Yes n(%)	*p*-value	NAP Yes n (%)	*p*-value	ADR Yes n(%)	*p*-value
Age							
> 50 years	236 (60.9%)	56/236 (23.7%)	0.126	23/236 (9.7%)	0.104	33/236 (13.9%)	<0.001
< 50 years	151(39.1%)	26/151 (17.2%)		23/151(15.2%)		3/151 (1.9%)	
Gender							
Male	251 (64.8%)	52/251 (20.7%)	0.758	31/251 (12.3%)	0.701	21/251 (8.36%)	0.389
Female	136 (35.1%)	30/136 (22.0%)		15/136 (11.0%)		15/136 (11.0%)	
Socioeconomic status							
Low	82 (21.18%)	9/82 (10.9%)	0.038	7/82 (8.5%)	0.572	2/82 (2.4%)	0.052
Middle	265 (68.4%)	63/265 (23.7%)		34/265 (12.8%)		29/265 (10.9%)	
High	40 (10.3%)	10/40 (25%)		5/40 (12.5%)		5/40 (12.5%)	
Preparation							
Adequate	312 (80.6%)	74/312(23.7%)	0.041	39/312 (12.5%)	0.748	35/312 (11.2%)	0.025
Fair	21 (5.4%)	3/21 (14.2%)		2/21 (9.5%)		1/21 (4.7%)	
Inadequate	54 (13.9%)	5/54 (9.2%)		5/54 (9.2%)		0/54 (0%)	

Table-III: Comparison between Morphology, Size and Site of Polyps, Non Adenomatous Polyps (NAP) and Adenomas

Morphology	Polyp Total n 82 n (%)	NAP n(%)	Adenoma n(%)	*p*-value
Sessile, 0-Is (n=53)	53/82 (64.6%)	34/53 (64.2%)	19/53 (35.8%)	< 0.001
Pedunculated, 0-Ip	11/82 (13.4%)	1/11(9.1%%)	10/11(90.9%)	
Semipedunculated, 0-Isp	8/82 (9.8%)	2/8 (25.0%)	6/8(75.0%)	
Slightly elevated 0-IIa	10/82 (12.2%)	9/10 (90.0%)	1/10 (10.0%)	
Size				
< 5 mm	60/82 (73.1%)	42/60 (70.0%)	18/60 (30.0%)	< 0.001
5-10 mm	11/82 (13.4%)	4/11 (36.4%)	7/11 (63.6%)	
10-15 mm	6/82 (7.3%)	0 (0%)	6/ 6(100.0%)	
15-20 mm	2/82 (2.4%)	0(0%)	2/2 (100.0%)	
> 20 mm	3/82 (3.6%)	0 (0%)	3/3(100.0%)	
Site				
Rectum	24/82 (29.2%)	13/24(54.2%)	11/24(45.8%)	0.544
Sigmoid Colon	27/82(32.9%)	14/27(51.9%)	13/27(48.1%)	
Descending Colon	11/82(13.4%)	5/11 (45.5%)	6/11(54.5%)	
Transverse Colon	9/82(10.9%)	6/9(66.9%)	3/9(33.3%)	
Ascending Colon	5/82(6.1%)	4/5(80.0%)	1/5(20.0%)	
Caecum	3/82(3.6%)	3/3(100.0%)	0(0%)	
Close to anus	2/82(2.4%)	1/2(50%)	1/2(50%)	
Multiple	1/82(1.2%)	0(0%)	1/1(100.0%)	

Table-IV: Relationship between Polyp size and Histology

Histology				Polyp size n(%)			
	Total 82 n (%)	< 5 mm	5-10 mm	10-15 mm	15-20 mm	> 20 mm	*p*-value
Hyperplastic	34/82 (41.5%)	32/34(94.1%)	2/34(5.9%)	0 (0%)	0(%)	0(0%)	< 0.001
Inflammatory	11/82 (13.4%)	9/11 (81.8%)	2/11 (18.2%)	0(0%)	0(%)	0(%)	
Retention	1/82 (1.2%)	1/1 (100.0%)	0(0%)	0(0%)	0(%)	0(%)	
Tubular	25/82 (30.5%)	17/25 (68.0%)	5/25 (20.0%)	3/25 (12.0%)	0(%)	0(%)	
Tubulovillous	8/82 (9.8%)	1/8(12.5%%)	2/8 (25.0%)	3/8 (37.5%)	1/8(12.5%)	1/8(12.5%)	
Villous	3/82 (3.6%)	0(0%)	0(%)	0(%)	1/3(33.3%)	2/3 (66.7%)	

Table-V: Relationship Between Adenoma size and Dysplasia

Dysplasia				Adenoma size n(%)			
	Total 36 n (%)	<5 mm	5-10 mm	10-15 mm	15-20 mm	>20 mm	*p*-value
Low Grade	26/36(72.2%)	18/26 (69.2%)	7/26 (26.9%)	1/26 (3.8%)	0(%)	0 (0%)	< 0.001
High Grade	10/36(27.8%)	0(%)	0(%)	5/10 (50%)	2/10(20%)	3/10 (30%)	

colonoscopic examination was 14.3%.[12] In another study by Rehman *et al.*,[13] the overall PDR was 11.3%, 2/3rd of patients with polyps were > 50 years. In other studies from the country, the overall PDR was 5.5% by Zia *et al.*,[14] 7.91% by Muhammad *et al.*,[15] and 7.93% Anwar *et al.*,[16] In the last four studies from our country the ADR was not analyzed.

Like our study, there was male preponderance in PDR in study by Rehman et al.,[13] Zia *et al.*,[14] and Anwar *et al.*,[16]. In the study by Yousuf *et al.*,[10] there was no significant difference between PDR and ADR in either gender. In our study there is significance of PDR with socioeconomic status, as also by Zia *et al.*,[14] but not with ADR. Our study has shown that bowel preparation has significance with PDR and ADR, as has been shown by Yousuf *et al.*,[10] and Alvi *et al.*,[17]

The adenoma detection rate varies; and has ranged from 7.4% to 52.5%.[9] In an audit of

colonoscopies performed in Northeast UK the ADR was 17.4% in patients >60 years.[9] In a US Veteran's Affairs study which included a baseline colonoscopy and at least one colonoscopy >1 year after baseline colonoscopy, the median ADR was 44.6%, and advanced ADR was 29.8%.[18] In a study from the Czech Republic, ADRs for screening (40-57%) and surveillance (44.6-52.8%) were higher than for diagnostic colonoscopies (30.3-46.2%).[19] In a metanalysis the pre-intervention ADR in studies ranged from 7.2 to 44.7%. The ADR increased with the availability of report cards to endoscopists, and the presence of an additional observer.[20]

The advent of AI/computer assisted programs has significantly enhanced the detection of subtle mucosal deformities of adenomas/polyps and nascent carcinoma. In a prospective randomized controlled study from China, the incorporation of a computer aided system (Artificial Intelligence, AI) significantly increased ADR (29.1% vs 20.3%, p<0.001). However, no statistical difference was found in the detection of larger adenomas with the system.[21] In multicenter randomized control trial from China, the overall ADR (39.9% vs 32.4%; p<.001), and advanced ADR (6.6% vs 4.9%; p=.041) both were higher in the AI-assisted colonoscopy group.[22] In a comparison of two randomized trials from Italy, the ADR was higher in the computer aided detection (CADe®), than in the control group (53.3% vs 44.5%; relative risk (RR): 1.22; 95% CI: 1.04 to 1.40; p<0.01.[23]

The developments of confocal laser endomicroscopy, optical coherence tomography in colonoscopy for early adenomas/polyps and cancers are also propitious. In genomics, for colorectal cancer, in a retrospective study the cell free DNA test has a sensitivity of 87.5% for confirmed Stage I to III tumors but the sensitivity for advanced precancerous lesions was low at 13.2%. A negative colonoscopy has a specificity of 89.9% for the absence colorectal cancer, advanced precancerous lesions and non-advanced precancerous lesions.[24]

Our study has certain limitations: it was a single center study, large scale multicenter studies should be done for establishing PDR/ADR prevalence in our population. The reasons for somewhat low PDR/ ADR, bowel preparation and other quality metrics as compared to western literature are multifactorial. The BBPS has since been incorporated into Colonoscopy report in our center with numerical score, though a subjective overall assessment is also provided (like Aronchick scale).

CONCLUSION

PDR and ADR increase with better preparation. Increase in polyp size was associated with adenomas of advanced features. The adenoma and polyp detection rate in our study is comparable to local literature. Large scale multicenter validation studies are required to define the baseline population based adenoma and polyp detection rate. Abidance by quality colonoscopy indicators enhances early detection of lesions including adenomas and polyps. There should be national guidelines for overall implementation of robust quality metrics in colonoscopy to deliver best outcomes for patients.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SA & FAS: Data acquisition, data analysis, critical review, approval of the final version to be published.

FH & LS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

IK & ALK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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