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ORIGINAL ARTICLE

Frequency of prolonged colonoscopy and its associated factors among adults: An experience of A Tertiary Care Hospital in Karachi, Pakistan.

Mashal Bai[1], Shahid Karim[2], Rajesh Kumar[3], Sindhu Rani[4], Afsheen Faryal[5]

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ABSTRACT… Objective: To determine frequency and factors associated with prolong cecal intubation among adults undergoing colonoscopy in a tertiary care hospital. **Study Design:** Cross-sectional study. **Setting:** Department of Gastroenterology, Liaquat National Hospital, Karachi, Pakistan. **Period:** September 2022 to June 2023. **Methods:** The study comprised patients undergoing elective colonoscopies, regardless of gender and age, who were at least eighteen years old. Cecal intubation time longer than ten minutes was regarded as a prolonged colonoscopy duration. The Aronchick scale, which is used to evaluate the quality of bowel preparation. The association between the patient's characteristics and the prolonged cecal intubation was investigated using logistic regression. P-values were considered statistically significant if they were less than or equal to 0.05. **Results:** Total 281 patients were enrolled into the study. Median age of patients was 40 (IQR=30-50) years and majority were males 66.5%. Median cecal intubation length and time was 90 (IQR=80-100) cm and 7 (IQR=5-10) minutes. Prolonged intubation was seen among nearly one-fifth of total patients (19.1%). Odds of prolonged cecal intubation were significantly lower patients of age <50 years, relatively higher body mass index (BMI), out-patients, patients with excellent quality of bowel preparation and among those cases in which colonoscopies were performed by consultant. **Conclusion:** Proportion of prolonged cecal intubation was high particularly among older age, female gender, patients with lower BMI, past surgeries and poor quality of bowel preparation.

Key words: Aronchick Scale, Body Mass Index, Bowel Preparation, Colonoscopy, Intubation.

INTRODUCTION

In modern medicine, colonoscopy has been a helpful technique for diagnosing and treating a variety of intestinal illnesses since the advent of the fiberoptic colonoscope in the late 1960s.[1,2] It is an essential life-saving procedure due to its adaptability and usefulness in both short and long-term scenarios. For the detection and treatment of a variety of ailments and symptoms, including both cancerous and non-cancerous disorders, such as sigmoid volvulus, gastrointestinal bleeding, and colonic impactions, colonoscopy is a frequently used procedure.[1,3] The procedure is carried out using a flexible, hand-held tube-like instrument known as a colonoscope. It includes an attached high definition camera at its tip and auxiliary channels that let the insertion of tools and liquids to clean the colonoscope's lens and the mucosa of the colon.[4]

The time needed for the colonoscope to go from the anal area to the cecum is known as the cecal intubation time (CIT).[5] Extended cecal intubation time (CIT) reduces the rate of adenoma detection, delays diagnosis and treatment, and has a negative impact on patient comfort. CIT is one of the quality markers in colonoscopies.[6,7] A colonoscopy can take as little as 10 minutes or, in more challenging situations, over 60 minutes to complete. While a difficult colonoscopy has no set definition, procedures taking longer than 10 minutes to complete, requiring more than two tries to reach the cecum, or ultimately resulting in a failure insertion are frequently regarded as tough.[8-10]

1. MBBS, Post-graduate Resident Gastroenterology, Liaquat National Hospital, Karachi.
2. MBBS, FCPS (Medicine), FCPS (Gastroenterology), Associate Professor Gastroenterology, Liaquat National Hospital, Karachi.
3. MBBS, FCPS (Gastroenterology), Assistant Professor Gastroenterology, Liaquat National Hospital, Karachi.
4. MBBS, FCPS (Internal Medicine), Associate Professor Medicine, Ghulam Muhammad Mahar Medical College, Sukkur.
5. MBBS, FCPS (Internal Medicine), Assistant Professor Medicine, Jinnah Medical & Dental College, Karachi.

Correspondence Address:
Dr. Mashal Bai
Department of Gastroenterology
Liaquat National Hospital, Karachi.
pahilanimashal@gmail.com

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There are numerous factors that affect the cecal insertion time, which can be broadly categorized into two groups: factors that depend on the patient and those that depend on the endoscopist. Factors that are depending on the patient include age, sex, waist circumference, BMI, and history of previous abdominal surgery or constipation. Quickly advancing the endoscope to the cecum, having competent skills, and effectively reducing loops are all endoscopic aspects.[11] The US Multi-society Task Force on Colorectal Cancer recommended that endoscopists strive for a cecal intubation rate of at least 90% in all examinations and 95% in screening colonoscopies.[12]

A colonoscopy that is technically challenging is indicated by a longer CIT.[13] A longer CIT is linked to a lower quality colonoscopy due to increased strain on the gastroenterologist performing the process, weariness among the colonoscopist, a lower incidence of polyp detection, increased patient pain, and a higher chance of procedure-related problems.[14] For a variety of reasons, including patient scheduling, endoscopy room staffing, physician and technical reimbursement, sedation requirements, and the potential for sedation-related complications, the colonoscopy insertion time and overall procedure duration are critical. Numerous research from the West have been done, however locally, there is a dearth of information about CIT. Due to variations in clinical environments, clinical practises, and patient characteristics, the factors vary from one context to another. It is crucial to research the CIT and the variables linked to extended CIT as a result. The objective of this study was to determine frequency and factors associated with prolong cecal intubation among adults undergoing colonoscopy in a tertiary care hospital.

METHODS

This cross-sectional study was carried out in the gastroenterology department of Liaquat National Hospital With permission from the hospital ethics committee (Ref:App#0719-2022-LNH-ERC). The study was carried-out during September 2022 to June 2023. Informed written consent was obtained from patients before they were enrolled. The study comprised patients receiving elective colonoscopies, regardless of gender and age, who were at least eighteen years old. Women who were pregnant or unable to reach the cecum were not allowed to participate in this study. A previously conducted study showed that 7% patients had colonoscopy time 10 minutes or above.[15] To achieve a precision of 3% and a p-value of 0.07 at a 95% confidence interval, 278 patients must be included in the sample. The Open-Epi online calculator was used to calculate the sample size. The study's patient population was drawn by a non-probability consecutive sampling method.

The time needed for the colonoscope to go from the anal area to the cecum was known as theCIT. CIT longer than 10 minutes was regarded as a prolonged colonoscopy duration. The formula for calculating body mass index (BMI) (kg/m^2) is to divide weight (kg) by height (in meters squared). The Aronchick scale, which is used to evaluate the quality of bowel preparation before washing or suctioning, measures the percentage of the entire colonic mucosal surface that is covered in fluid or faeces without assigning a score for individual colon segments. There is a 1-5 scoring range with 1 being excellent and 5 being inadequate.[16] A pre-made study proforma was used to record the clinical and socio-demographic characteristics of the patients.

Spreadsheets containing the data gathered for the study were uploaded, and IBM SPSS version 26 was used to do statistical analysis. For categorical variables, percentages and frequencies were calculated. Due to their non-normal distribution, numerical variables were reported as the median with the inter-quartile range (IQR). The association between the patient's characteristics and the prolonged cecal intubation was investigated using logistic regression. P-values were considered statistically significant if they were less than or equal to 0.05.

RESULTS

Total 281 patients were enrolled into the study. Median age of patients was 40 (IQR=30-50) years. Median BMI and waist circumference were 26 (IQR=22.9-28.5) kg/m^2 and 96 (IQR=80-107)

cm respectively. Around one-third patients had comorbid diseases (69.8%). Median number of stools and number of water glass intake was 5 (IQR=4-6) and 8 (IQR=5-9) respectively. Most of colonoscopy was performed by consultant (55.9%) whereas 44.1% were performed trainees. Patients presented with complaints of bleeding per rectum (34.9%), constipation (32%), weight loss (21.7%), abdominal pain (17.4%), chronic diarrhea (12.1%), anemia (7.5%), alternate bowel habits (4.6%), loose stools (3.2%), painful defecation (2.1%), increased stool frequency (1.8%), melena (1.1%), incomplete stool evacuation (0.7%) and fecal incontinence (0.7%). Table-I displays demographic and clinical profile of patients.

Variables		Frequency	Percentage
Age groups	<50 years	215	76.5
	≥50 years	66	23.5
Gender	Male	187	66.5
	Female	94	33.5
Body mass index	<25Kg/m^2	163	58.0
	≥25 Kg/m^2	118	42.0
Comorbidity	Diabetes	59	21.0
	Hypertension	74	26.3
	Ischemic heart disease	11	3.9
History of abdominal/pelvic surgery		52	18.5
Extra analgesic requirement		128	45.6
Sedation		279	99.3
Diveritcula		21	7.5
Colonic purgatives	Colonic wash	101	35.9
	Movocol	74	26.3
	Dulcolax	106	37.7
Stool consistency	Liquid	208	74
	Semi-solid	73	26
Patient type	In-patient	80	28.5
	Out-patient	201	71.5
Shift	Morning	227	80.8
	Afternoon	54	19.2
Quality of bowel preparation	Excellent	111	39.5
	Good	86	30.6
	Fair	50	17.8
	Poor	34	12.1

Table-I. Summary of demographic and clinical profile of patients (n=281)

Median cecal intubation length and time was 90 (IQR=80-100) cm and 7 (IQR=5-10) minutes. Prolong intubation was seen among nearly one-fifth of total patients (19.1%). Table-I displays comparison of patients' features among those with and without prolonged intubation time and their univariate association with prolong intubation time. Odds of prolong cecal intubation were significantly lower patients of age <50 years, out-patients, patients with excellent quality of bowel preparation and among those cases in which colonoscopies were performed by consultant.

DISCUSSION

Comprehending the variables that contribute to extended CIT is important for a thorough colonoscopy since it will enable reducing patient discomfort, procedure-related fatigue, and colonoscopist burden. For this reason, the goal of the present study was to identify the variables contributing to extended colonoscopies in our community. The present study found that median colonoscopy time 7 minutes whereas prolonged colonoscopy was observed among 19.9% patients. A similar Korean study reported a mean cecal intubation time of 5.0±4.2 minutes whereas it was prolonged in only 6.8% patients.[15] Average CIT was 5.82 ± 3.40 minutes in a study performed in Saudi Arabia.[17] Mean CIT of 5.6±3.2 minutes was reported from a similar study conducted by Hsu et al.[18] In a study performed in Turkey, a higher CIT of 9.11±6.00 minutes and 10.21±3.45 minutes for women and men respectively.[4] A study from Nigeria also reported a higher CIT time of 1037.1 ± 436.7 seconds for females and 991.7 ± 395.9 seconds for males.[19] Average CIT could be different among different countries because of different healthcare settings and colonoscopy techniques.

This study analyzed that risk of prolong colonoscopy was significantly lower among patients with younger than 50 years. The finding of lower risk of prolong colonoscopy among younger patients is consistently reported in literature.[15,18,19] It can be postulated that the mechanisms underlying longer colonial intervals in elderly patients may be associated with longer colons. Furthermore, elderly patients' mesenteries are more pliable and elastic, which increases the risk of loop formation during a colonoscopy.

Variables		Prolonged intubation		OR (95% CI)	P-Values
		Yes n(%)	No n(%)		
Age groups	<50 years	37(17.2)	178(82.8)	0.51 (0.27-0.97)	*0.042
	≥50 years	19(28.8)	47(71.2)	Reference category	
Gender	Male	25(13.4)	162(86.6)	0.31 (0.17-0.57)	**<0.001
	Female	31(33)	63(67)	Reference category	
Body mass index	<25Kg/m^2	24(14.7)	139(85.3)	2.15 (1.19-3.90)	*0.011
	≥25 Kg/m^2	32(27.1)	86(72.9)	Reference category	
Diabetes		17(28.8)	42(71.2)	1.89 (0.98-3.67)	0.057
Hypertension		15(20.3)	59(79.7)	1.02 (0.53-1.99)	0.932
Ischemic heart disease		3(27.3)	8(72.7)	1.53 (0.39-5.98)	0.537
History of abdominal or pelvic surgery		32(61.5)	20(38.5)	13.67 (6.78-27.53)	**<0.001
Extra analgesic requirement		41(32)	87(68)	4.33 (2.26-8.30)	**<0.001
Sedation		56(20.1)	223(79.9)	-	-
Diverticulae		6(28.6)	15(71.4)	1.68 (0.62-4.54)	0.307
Colonic purgatives	Colonic wash	13(12.9)	88(87.1)	Reference category	
	Movocol	21(28.4)	53(71.6)	2.68 (1.24-5.79)	*0.012
	Dulcolax	22(20.8)	84(79.2)	1.77 (0.84-3.74)	0.134
Water glasses intake		3 (3-4)	8 (8-9)	0.51 (0.43-0.60)	**<0.001
Number of stools		3 (3-2)	5 (4-6)	0.042 (0.01-0.05)	**<0.001
Stool consistency	Semi-solid	41(56.2)	32(43.8)	16.48 (8.18-33.19)	**<0.001
	Liquid	15(7.2)	193(92.8)	Reference category	
Patient type	Outpatient	13(6.5)	188(93.5)	0.060 (0.029-0.12)	**<0.001
	Inpatient	43(53.8)	37(46.3)	Reference category	
Shift	Morning	48(21.1)	179(78.9)	1.54 (0.68-3.48)	0.298
	Afternoon	8(14.8)	46(85.2)	Reference category	
Quality of bowel preparation	Excellent	13(11.7)	98(88.3)	0.27 (0.11-0.69)	**0.006
	Good	15(17.4)	71(82.6)	0.44 (0.17-1.09)	0.078
	Fair	17(34)	33(66)	1.07 (0.42-2.72)	0.875
	Poor	11(32.4)	23(67.6)		
Colonoscopy was performed by	Consultant	10(6.4)	147(93.6)	0.11 (0.05-0.24)	**<0.001
	Resident	46(37.1)	78(62.9)	Reference category	

Table-II. Comparison of patients' features among those with and without and their association with prolonged intubation time (N=281)

CI: Confidence interval, OR: Odds ratio, *Significant at p<0.05, **Significant at p<0.01

The present study found that risk of prolong colonoscopies was significantly higher among females than males. Our findings are in line with most of the earlier studies reporting female gender as risk factor for prolong colonoscopies.[15,17,18] However, in a similar study males were found to have higher CIT time than females.[19] The majority was males in this studies that's why the findings was conflicting. Women generally known to accumulate fat more in the gluteal and femoral regions compared to men, who tend to accumulate fat more in the visceral and abdominal regions, which could be an understandable reason of prolonging CIT among females.[20]

In this study, lower BMI was found to be linked with higher colonoscopy time. Another similar study analyzed that for a five-unit increase in patient's BMI, the CIT is expected to decrease by 3.2%.[10] A previous meta-analysis found that a lower BMI is associated with a longer CIT.[9] In contrast to our study, Kim HY et al[15] did not demonstrate BMI association to prolong CIT. It is most likely the case that patients who are obese or overweight have a shorter CIT because these patients tend to have higher visceral fat, which supports the colon and reduces loop development. Additionally, it has been noted that patients who are overweight or obese have shorter colons, which may facilitate

quicker cecal intubation.[21]

The present analyzed longer CIT among patients with previous abdominal or pelvic surgeries. It has been noted that a fixed and angulated sigmoid colon associated with previous abdominal/pelvic surgery, particularly abdominal hysterectomy, may complicate colonoscopy. A past hysterectomy was found to be a predictor of difficult colonic intubation in a Japanese study conducted by Takahashi et al.[12] But there was no correlation found by Waye and Bashkoff between cecal intubation and a previous abdominal hysterectomy.[13] It is the fact that, depending on whether a specialist or a fellow in training performed the colonoscopy, the colonoscopist's level of experience also affects CIT. Unfortunately, in our study prolong CIT risk was significantly higher when performed by trainees. Interestingly, it was noted in our study that patient type either patient from out-patient or in-patient department was associated with prolong CIT with significantly lower CIT risk among out-patients.

We assume that out-patients are being prepared in out-patient department under direct supervision of treating consultants whereas patients admitted in hospital are being prepared by nurses and trainee doctors in a ward. Usually nurses and trainee doctors are not full time present on patient bed-side in wards and patient or their attendants do not properly comply with the instruction due to which this difference was seen. Moreover, it was seen in our study there was no impact of shift either patient was prepared in morning or in evening shift. However, type of purgatives were significantly linked to prolong CIT. Quality of bowel preparation was found to be associated with prolong CIT with considerable lower risk among those who had excellent bowel preparation.

Simultaneously, patients with semi-solid stool and who had less water intake had higher prolong intubation risk which are the most possible reason of poor bowel preparation. This finding of quality of bowel preparation is in line to the available literature.[15,18,19] However, existing studies did not evaluate number of water glass intake and stool consistency and number of stools with CIT.[15,18,19]

The present study was performed in a single center institution in Karachi with limited sample size. The findings of this study could be generalized to the entire Pakistani healthcare system as administrative and clinical factors may vary from institution to institution. Therefore, it would be better to conduct a multi-center study with a larger sample size to comprehend predictive factors of prolong cecal intubation in Pakistani settings.

CONCLUSION

Proportion of prolonged cecal intubation was high particularly among older age, female gender, patients with lower BMI, past surgeries and poor quality of bowel preparation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Mashal Bai	Conceptualized the study, Involved in data collection, Initial manuscript writing.	
2	Shahid Karim	Designed the study protocol, Critically revised the initial manuscript draft.	
3	Rajesh Kumar	Data collection, Initial manuscript writing.	
4	Sindhu Rani	Performed data analysis and involved in result writing.	
5	Afsheen Faryal	Performed data analysis and involved in result writing.	