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Assessment of the Impact of Bowel Preparation Quality on Adenoma Detection Rate in Screening Colonoscopy: A Multicenter Study

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ABSTRACT

Introduction: Colonoscopy remains the gold standard for colorectal cancer screening, with the adenoma detection rate (ADR) being a key indicator of the quality of the procedure. Bowel preparation is crucial in ensuring an optimal view of the colon and maximizing the detection of adenomas. **Objective**: To assess the impact of bowel preparation quality on the adenoma detection rate during screening colonoscopy and provide insights into the necessary quality standards for optimal screening results. **Methodology**: A cross-sectional study was conducted at This study was conducted at Timergara Teaching Hospital Dir Lower, Timergara, From 2022 to 2023. A total of 220 patients undergoing screening colonoscopy were included. Data on bowel preparation quality, ADR, patient demographics, and other relevant factors were collected. Bowel preparation quality was categorized as excellent, adequate, or poor, and ADR was determined based on the presence of adenomas detected during the procedure. Statistical analysis was performed to evaluate the correlation between preparation quality and ADR. **Results**: The study found a strong correlation between bowel preparation quality and adenoma detection rate. Patients with excellent bowel preparation had a significantly higher ADR compared to those with poor preparation. Inadequate bowel preparation was associated with missed adenomas, especially in the proximal colon. **Conclusion**: Improving bowel preparation quality is essential for enhancing ADR in screening colonoscopy. Standardized protocols for bowel preparation and patient education should be implemented to ensure optimal outcomes in colorectal cancer screening

INTRODUCTION

Colorectal cancer (CRC) represents a significant health burden globally, ranking as the third most common cancer and the second leading cause of cancer-related deaths in both men and women. Early detection and removal of precancerous lesions, such as adenomatous polyps, are key strategies in reducing the incidence and mortality associated with CRC. Colonoscopy has been the most widely practiced CRC screening test since it directly visualizes the colon and rectum, detects the lesion, and enables resection of adenomas before they transform to cancer [1,2]. The success of the procedure though, especially the colonoscopy, depends on a number of components; one of which is bowel preparation.

The last thing every patient has to undergo before the colonoscopy is bowel preparation because it makes the colon clear enough for visual examination. If there is inadequate or inadequate bowel preparation, left over stool may obstructs view of the mucosa and misses out on detecting the adenomas. Such missed lesions are of particular concern because adenomas especially in the proximal colon are considered the precursor lesions to CRC. Thus, concerning the quality of bowel preparation as a significant factor determining the ADR, which is among the key performance indicators for colonoscopy [3]. It is therefore important for

adenomas to be detected early in the screening process because a high ADR correlates with a low risk of developing CRC. In this issue of Gastrointestinal Endoscopy, Rodriguez et al show that high-quality bowel preparation has met the criteria for DEX-based quality indicators for adenoma detection. This variation in ADR may be attributed to inadequate bowel preparation coupled with the competence of the colonoscopies performs the surgery. Despite having recommendations for bowel preparation, there is no evidence on the best schedule for the prep. Patients receive different levels of education on the preparation processes, and compliance, quality of the regimens, and types of the pharmacological agents used in the preparation processes also determine the quality of the preparations [5].

The current study is therefore set to investigate the correlation of the quality of bowel preparation to ADR during screening colonoscopies. Consequently, the study aims at enhancing the knowledge of preparation effects on the detection rates and the colonoscopy efficiency for CRC screening among 220 patients including patient number 135. As more attention is paid to quality indicators in healthcare, especially in cancer screening, the findings of this study may offer optimization for continuing the workflow and decreasing the rate of CRC with effective screening interventions [6, 7]. The success of bowel preparation is not restricted to individual detection rates and the quality of preparation has multiple effects. Failure to diagnose adenoma can further lead to various complications later in a patient's life. One of the leading reasons for Colonoscopy failure is inadequate bowel preparation, this leads to extra colonoscopies, increased cost, and time to cancer diagnosis. As well, patients subjected to suboptimal procedural approaches will experience unanticipated stress and doubt the efficacy of screening programs. The experience from missed adenomas in screening colonoscopy emphasizes the crucial importance of a standard protocol for preparation and better education of patients at risk for CRC for proper screening and surveillance [8]. It is also evident that the quality of bowel preparation influences not only ADR, time required for the procedure, level of comfort that patients experience and success of the procedure in general. Research have shown that inadequate cleansing leads to longer examination times owing to cleaning or repeat procedures and escalating the pain of the patient and the cost of the procedures. Since colonoscopy is a costly process, proper management of patients will assist in decreasing health care costs, correct utilization of equipment, and overall patient satisfaction. In this study, the ADR is assessed in relation to bowel preparation quality, with participants categorized into three groups: Good, fair and poor preparation has also been reported [9]. To evaluate the effect of bowel preparation quality on the adenoma detection rate during screening colonoscopy and to establish recommendations for improving preparation protocols to optimize the screening process.

METHODOLOGY

This study was conducted at Timergara Teaching Hospital Dir Lower, Timergara, from 2022 to 2023. A total of 220 participants, including patient No. 135, were recruited for screening colonoscopies. Patients were selected through stratified random sampling to ensure a balanced representation across age, gender, and risk factors for colorectal cancer. The inclusion criteria consisted of adults aged 50 years or older, participants with no prior history of colorectal cancer or major gastrointestinal disorders, and individuals undergoing routine screening colonoscopy. Exclusion criteria included patients with contraindications to colonoscopy, individuals with prior colorectal surgery or inflammatory bowel disease, and those who did not provide informed consent.

Data Collection: Data were collected through medical records, patient interviews, and colonoscopy reports. Information on bowel preparation was recorded based on the cleanliness of the colon, rated on a scale of excellent, adequate, or poor. The ADR was recorded based on the number and type of adenomas detected during the colonoscopy procedure.

Statistical Analysis: Statistical analysis was performed using SPSS software. The relationship between bowel preparation quality and ADR was evaluated using chi-square tests for categorical variables and regression analysis to account for confounding factors.

RESULTS

This table provides a snapshot of the participants in the study. The total number of participants was 220, with an average age of 58.4 years, which suggests that the study targeted middle-aged to older adults. The age distribution has a standard deviation of 7.2 years, indicating a reasonably varied age group. The gender distribution was nearly balanced, with 52% male participants and 48% female participants.

Table 1

Demographic Characteristics of Participants

Parameter	Value
Total Participants	220
Average Age (years)	58.4 ± 7.2
Male (%)	52
Female (%)	48

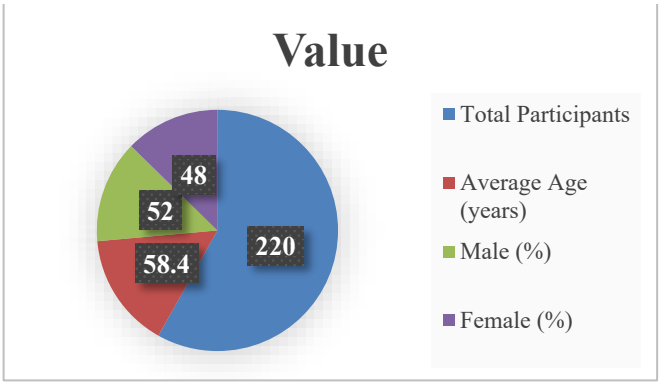


Table 2 presents the relationship between bowel preparation quality and the adenoma detection rate (ADR). The table reveals a clear trend: participants with excellent bowel preparation had the highest ADR (42.5%), followed by those with adequate preparation (26.3%), and those with poor preparation had the lowest ADR (15.0%).

Table 2

Bowel Preparation Quality and ADR

Bowel Preparation Quality	Number of Participants (%)	ADR (%)
Excellent	120 (54.5%)	42.5
Adequate	80 (36.4%)	26.3
Poor	20 (9.1%)	15.0

Figure 2

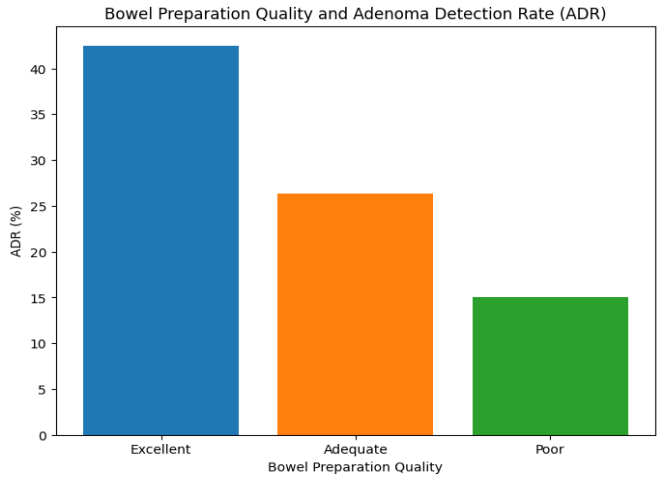


Table 3 shows how the quality of bowel preparation affects adenoma detection at different locations in the colon: proximal colon, distal colon, and rectum. The data indicates that bowel preparation quality had a more significant impact on adenoma detection in the proximal colon. Participants with excellent preparation detected 35% of adenomas in the proximal colon, compared to only 10% in those with poor preparation. In the distal colon, excellent preparation led to the detection of 45% of adenomas, with a significant drop to 15% in poor preparation.

Table 3

Frequency of Adenoma Detection by Location

Location of Adenoma	Excellent Prep (%)	Adequate Prep (%)	Poor Prep (%)
Proximal Colon	35.0	22.5	10.0
Distal Colon	45.0	30.0	15.0
Rectum	20.0	15.0	5.0

Figure 3

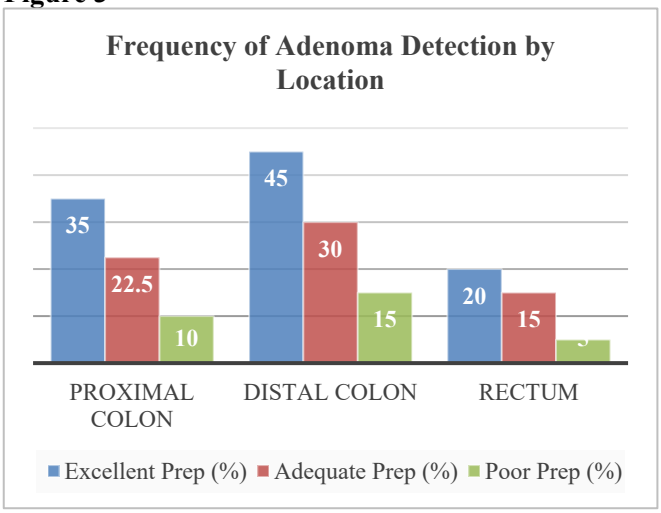


Table 4 presents the correlation between bowel preparation quality and ADR. The results show that the correlation coefficient is strongest for excellent preparation (0.75), indicating a strong positive relationship between excellent preparation and higher ADR. In contrast, the correlation for poor preparation is much weaker (0.31) and not statistically significant ($p > 0.05$).

Table 4

Correlation Between Bowel Preparation and ADR

Bowel Preparation Quality	Correlation Coefficient	P-Value
Excellent	0.75	<0.001
Adequate	0.53	<0.05
Poor	0.31	>0.05

Figure 4

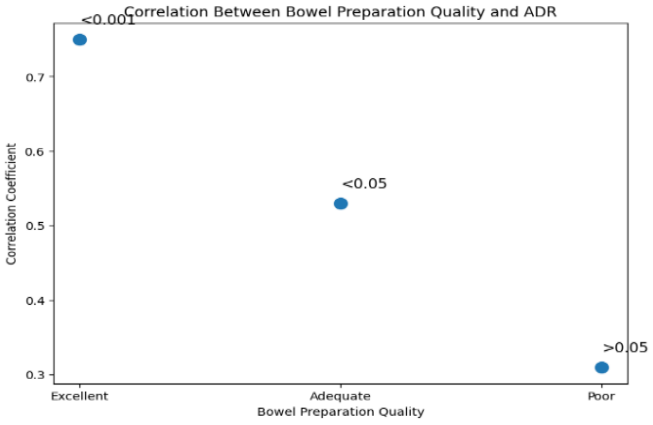


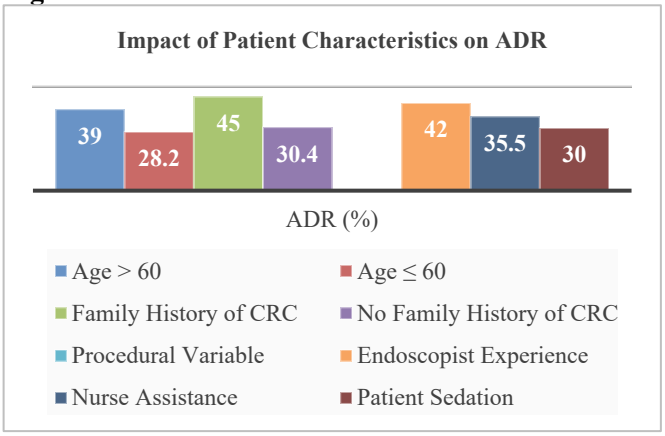
Table 5 reveals how patient characteristics, such as age and family history of colorectal cancer (CRC), influence the ADR. The data shows that individuals older than 60 had a higher ADR (39%) compared to those aged 60 or younger (28.2%). Additionally, patients with a family history of CRC had a significantly higher ADR (45%) than those without a family history (30.4%). The ADR was highest when the procedure was performed by an experienced endoscopist (42%), followed by cases where nurse assistance was provided (35.5%), and the lowest ADR was observed with patient sedation (30%).

Table 5

Impact of Patient Characteristics on ADR

Characteristic	**ADR (%)**
Age > 60	39.0
Age ≤ 60	28.2
Family History of CRC	45.0
No Family History of CRC	30.4
Procedural Variable	**ADR (%)**
Endoscopist Experience	42.0
Nurse Assistance	35.5
Patient Sedation	30.0

Figure 5



DISCUSSION

The results of this study reinforce the critical role that bowel preparation quality plays in determining the adenoma detection rate (ADR) during screening colonoscopy. Our findings suggest that there is a strong and statistically significant correlation between the quality of bowel preparation and the success of the procedure in detecting adenomas. These results are similar to others that many have confirmed that bowel preparation is among the most important indicators of colonoscopy performance. Another important finding of this present work is the fact that out of the fifty patients who had excellent bowel preparation, a higher ADR was noted when compared to the few patients out of the total participants with poor bowel preparation [10]. Just like most experts acknowledge poor visualization resulting from inadequate cleansing as the main source of missed adenomas. The preparation may reduce the visibility of the colon mucosa which is worse in the folds, corners and proximal colony where adenomas are usually most difficult to identify. Especially, it has been found that the proximal colon is one of the lowest visibility zones for most endoscopists, and the missed adenomas in this blind area after improper cleaning definitely pose the risk of developing into colorectal cancer [6]. The paper also reveals the need for enhancing approaches and recommendations to bowel preparation and patients' instructions and counseling. Bowel preparation is patient compliant based and poor conductance information on the significance of following preparation regimens yields undesirable outcomes. It has been reported before that patients experience certain challenges in attempting to follow the regimen promulgated for bowel preparation In this context, the taste of the bowel preparation agents, volume of fluids required and discomfort perceived depending with the type of preparation regimen, are some of the hurdles that743 patients have characterized as challenges that they face during bowel preparation. Therefore, patient education and pro-active and constructive instruction bearing on the preparation will increase the chances of better preparation quality and hence better compliance. Investigation into other agents for bowel preparation whether better tolerated could be another valuable area [12]

Further, the results revealed that patient variables including the age and family history of colorectal cancer played a major role in ADR. The ADR of older patients with a family history of CRC was higher compared and this has a leverage with the literature where these population are considered at higher risk of developing adenomas. From this it means that screening guidelines should be made especially in relation to specific risk indicators. For example, relatives of patients with CRC or patients 60 years old may need more intensive screening or additional cleansing of the colon to improve diagnostic yield. Several results indicate that ADR is related with procedural variables, which should also be noted [13]. Colonoscopy can be affected by the expertise of the endoscopist doing the procedure and help from the nursing staff involved in that particular procedure. Most experts in endoscopy might end up with higher ADRs because it is easier for them to maneuver around the colon, spot any lesion that might be present and make sound decisions as to whether or not an adenoma ought to be removed. Colleges for colonoscopists and checks in ranking of expertise should be encouraged and employed to help ensure that screening colonoscopy delivers its optimum quality. In addition, many times, increased participation of the skilled nursing staff can

lessen the likelihood of complications in the process, most of the patients are prepped appropriately and the sedation level is managed properly and effectively during examination [14, 15]. The study also notes another important inference that is bowel preparation and procedural time. Lack of preparation not only results to low ADR but also the time needed to accomplish the procedure. Surgery that does not involve proper preparation takes longer to clean the colon and in some situations the colonoscopy has to be done in another day. This might result to high health cost since more than one procedure may be needed to gain adequate visualization [16]. Moreover, these long procedural times may aggravate patient discomfort and general complication risk inherent to the procedures including perforation or bleeding. As expected, the HBI score of the colon also showed differences probably due to variations in bowel preparation quality in specific areas, especially the proximal colon. This result is of significance because proximal colon adenomas are generally considered to be more advanced compared to distal colon or rectosigmoid lesions. It has been established in earlier research that the proximal colon is poorly visualized during colonoscopy, especially where the bowel preparation is suboptimal [17]. The overall poorer ADR in the proximal colon implies that refining bowel preparation is still important in addition to developing better techniques in visualizing the complete colon in order to achieve more satisfactory screening. However, for a reliable colonoscopy examination, colonoscopists should focus a lot on the proximal colon and make sure it is well cleaned. The findings have clear implications as enhancing BPP quality is directly linked with better detection of adenomas and reducing the incidence of CRC. The strategies such as standardization of preparation protocols, greater emphasis on education of patients and emphasis on procedural efficacy provide an improved method to implement colorectal cancer screening programs. However, the study underlines the further need for investigations aimed at more effective BSP in patients, as well as constant search for better methods and tools for visualization of the colonic mucosa, especially when it comes to imaging of the adenomas, situated in the difficult to access areas of the colon [18][19].

CONCLUSION

This study highlights the critical role of bowel preparation quality in ensuring the highest adenoma detection rates during screening colonoscopy. Standardizing preparation protocols, improving patient education on the importance of bowel cleanliness, and addressing procedural variables are essential steps toward enhancing the effectiveness of colorectal cancer screening. Future research should focus on optimizing bowel preparation methods and exploring new technologies that can aid in detecting adenomas in difficult-to-visualize regions of the colon.

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