

Comparison between the Effectiveness Fecal Immunochemical Test and Colonoscopy As A Tool For Colorectal Cancer Early Detection

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Abstract

Cancer is a disease that causes a lot of misery and death in humans. According to data from the World Health Organization (WHO) in 2015, there are 8.8 million deaths caused by cancer and colorectal cancer ranked third with 774,000 deaths. One of the prevention effort for colorectal cancer is early detection in the population, especially in high-risk groups and in groups with non-specific symptoms. In general, two types of early detection tests are available: stool-based testing and structural testing. Fecal immunochemical test (FIT) is one type of examination that is categorized as the tool-based test. Meanwhile, the structural test include colonoscopy, CT colonography and flexible sigmoidoscopy. This study aimed to determine difference in the effectiveness of FIT against colonoscopy as an early detection tool for colorectal cancer. This study was a cross-sectional comparative diagnostic analytical observational study to compare FIT to colonoscopy for early detection of colorectal cancer. This study involved patients presented to Dr. Hasan Sadikin General Hospital Bandung, Indonesia. Analysis of diagnostic test data was carried out to obtain the sensitivity, specificity, and the positive and negative predictive values through the use of bivariate analysis in the form of Man Whitney test. Thirty-eight patients were included in this study, consisting of 27 cancer patients and 11 non-cancer patients. Results showed that the sensitivity level of FIT was 81.5%, with 72.7% specificity. There is no significant difference in the effectiveness between FIT and colonoscopy in screening for colorectal cancer.

Keywords: Cancer, colorectal cancer, colonoscopy, comparative studies, fecal immunochemical test

Introduction

Colorectal cancer is a malignancy originating from the large intestine, consisting of the colon (the longest part of the large intestine) and/or the rectum (the last small part of the large intestine before the anus). According to the American Cancer Society, colorectal cancer is the third most common cancer and the third leading cause of cancer death in men and women in the United States. Based on the 2018 GLOBOCAN survey (Global Burden of Cancer Study), the incidence of colorectal cancer worldwide ranks third (1360 out of 100,000 populations) and ranks fourth as a cause of death (694 out of 100,000 populations).¹

Colorectal cancer is generally more common in elderly individuals and is very rare in children. Suspicion of colorectal cancer can be seen based on the symptoms experienced by the patient. Symptoms that often arise in someone suffering

from colorectal cancer are bleeding in the lower gastrointestinal tract, which is characterized by bloody discharge during defecation, an increase in the number of feces produced and often accompanied by diarrhea that lasts for more than 6 weeks. In addition, other symptoms are signs of blockage in the intestines and the occurrence of weight loss for no apparent reason.^{1,2}

Colorectal cancer/carcinoma can be diagnosed by definitive biopsy, including fine needle aspiration biopsy (FNAB), core biopsy, or subtotal removal of a single node. Microscopic examination by a pathologist is necessary to identify the molecular, cellular or architectural characteristics of the epithelial tissue. Carcinoma cancer cell structure has a large nucleus size, round monotone and has abundant cytoplasm. Microscopically, an adenocarcinoma can be seen with various glandular arrangements and cell types, some containing excessive mucin in the cytoplasm to be called signet-ring cells or forming so much mucin that it is called mucoid carcinoma.^{1,3}

Prompt diagnosis and management help reduce the risk of dying from colorectal cancer. Appropriate diagnosis can be assisted by

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early detection of patients suspected of having colorectal cancer symptoms. Apart from being the first step in establishing a diagnosis, early detection also aims to remove the lesion pre-cancer and specifically detects disease at an early stage so that curative therapy can be performed.⁴

Early detection of colorectal cancer is primarily indicated in patients with the following conditions: individuals with history of adenomatous polyps, individuals with a history of colorectal cancer curative resection, individuals with first-degree relatives with history of colorectal cancer or colorectal adenoma (recommendations differ based on family age at diagnosis), individuals with a long history of inflammatory bowel disease. Individuals with a diagnosis or suspicion of hereditary nonpolyposis colorectal cancer (HNPCC) syndrome or Lynch syndrome or familial adenomatous polyposis (FAP).⁵

In general, there are 2 types of early detection that can be done, namely Stool Based Test and Structural Exams. In the Stool Based examination, the sample used is feces by looking at several components that may appear. This test is considered non-invasive, easy to do but should be done more often. In addition, this examination will still require confirmation through examination visual (structural) exams if abnormal results are found.⁶

One of the best ways to check for cancer is to look for blood in the stool. This is because in cases of colorectal polyps or colorectal cancer there will be neovascularization that is fragile and will be very easily damaged when feces pass through these lesions. But often the resulting blood cannot be seen with the naked eye. Examination of fecal immunochemical test (FIT) is one method of assessing the presence or absence of blood in the stool. This check is easier to do but must be done every year.⁶

The FIT examination has several differences compared to the fecal occult blood test (FOBT) which is also included in the Stool Based Test. In the FIT examination, it is not necessary to do a special diet, or treatment must be stopped first because vitamins and food will not affect the results of the examination. This examination is also less responsive to upper gastrointestinal bleeding so the possibility of bias due to other bleeding is lower.⁷

The sampling procedure of the FIT can also be performed independently by the patient. Patients will be provided with the necessary equipment for sampling such as test kits, test

cards/tubes, long brushes/collecting devices, and waste bags.⁸

Meanwhile, colonoscopy, which is one of the modalities of Structural Exams, can be performed by looking at the colon and rectum using a colonoscope. A colonoscope is a flexible tube about the size of a finger with a video camera at the end. The colonoscope is inserted through the anus into the rectum and colon. This colonoscope is also accompanied by an instrument to take samples if needed.⁷

Based on its advantages, FIT has advantages in the form of no risk of trauma to the colon because the examination is not invasive, no special preparation is needed, the sampling process is easier to do and can be done at home, and cheaper. However, there are some drawbacks to FIT, such as not being able to detect some types of polyps and cancer, it can give results false positive, it must be done every year and a colonoscopy should still be done if abnormal results are found.^{6,18} On the other hand, colonoscopy is still considered to be the most accurate test for early detection and prevention of colorectal cancer but also has constraints in terms of cost and patient convenience. The aim of study, interested in comparing the effectiveness of the fecal immunochemical test (FIT) against colonoscopy. as an early detection tool for colorectal cancer.

Methods

This study was conducted at Dr. Hasan Sadikin Bandung General Hospital during the period January 2021–April 2021 with the subject were adult colorectal cancer patients aged more than 18 years who came to the Digestive Surgery Department of Dr. Hasan Sadikin Bandung General Hospital which meet the inclusion criteria and did not include the exclusion criteria. This study consisted of independent variables in the form of FIT and colonoscopy as an early detection tool and the effectiveness of each therapy as the dependent variable. This research procedure was approved by the Health Research Ethics Committee No.LB.02.01/X.6.5/300/2021, Universitas Padjadjaran Bandung.

This study was an observational analytic diagnostic test study using a cross-sectional design that aimed to compare the effectiveness of the fecal immunochemical test (FIT) against colonoscopy. as an early detection tool for

colorectal cancer.

This study was conducted on patients who had symptoms of colorectal cancer with an affordable population including patients undergoing examination and treatment at the Digestive Surgery Department of Dr. Hasan Sadikin Bandung General Hospital. Research subjects must be patients with suspected colorectal cancer and a high risk of colorectal cancer, aged more than 18 years and willing to participate in the study for a predetermined period of time after has been informed consent obtained. The exclusion criteria in this study were patients who had undergone surgery and patients who were undergoing or had completed chemotherapy.

The minimum sample size was determined based on the sample size formula for diagnostic tests with a 95% confidence interval. Meanwhile, colonoscopy's sensitivity method was 90%. So that the minimum number of samples needed was 35 patients, added 10% to avoid sample shortages due to drop out so that it became 38 patients. The sampling technique was carried out by consecutive sampling, namely based on the order of arrival of patients who met the inclusion criteria until the minimum sample size was met. Determination of the sample starts from the selection of members of the population against the inclusion and exclusion criteria. Where the selected sample was a sample that can be reached by researchers and has met the inclusion criteria and exclusion criteria.

All research subjects were examined by history taking and physical examination related to colorectal cancer. Physical examination was also assessed to help diagnose colorectal cancer. Subsequent research subjects underwent FIT examination and colonoscopy to diagnose suspected colorectal cancer.

The analysis carried out was a diagnostic test to obtain sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). then bivariate analysis was performed/ conducted using chi square difference test to compare the incident of colorectal cancer cases between the group who used FIT with those who used colonoscopy for screening. The hypotheses were tested using Mann-Whitney U test. The results of statistical tests were said to be meaningful if the p value was less than 0.05. The data obtained were recorded in a special form and then processed through the SPSS version 21.0 program for Windows.

Results

During the period of January 2021–April 2021, 38 patients with symptoms resembling colorectal cancer were examined and treated at the Digestive Surgery Department, Dr. Hasan Sadikin Bandung General Hospital, with details as many as 27 people were colorectal cancer patients and 11 patients who were not colorectal cancer but have colitis. The following table was the result of the identification of the research subject characteristics totaling 38 patients.

Based on Table 1, it can be seen that the age of the majority of research subjects was in the range of 56–65 years with 12 of 38 patients. Then the second place, namely the age range of 46–55 years, totaling nine patients were in the age range of 46–55 years, and only 1 patient in the lowest age range (17–25 years), only 1 person. When viewed by gender, 20 of 38 of patients. A total of 29 of 38 people had comorbidities. There were several risk factors in patients, include the most combination of age, physical activity, diet and smoking. These factors was a higher when compared to other risk factors.

Analysis of hypothesis testing was carried out using the Mann Whitney test comparison. Then tested for sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). The following was a recapitulation of the hypothesis testing result.

Based on the recapitulation of the results in Table 2, it can be seen that the p-value of the Mann Whitney test showed 0.624. Because the p-value >0.05 means that there was no statistically significant difference in the effectiveness of the fecal immunochemical test on colonoscopy as a screening tool for colorectal cancer. In other words, the results of the FIT were almost the same as the results of the colonoscopy. The sensitivity level of the FIT was 81.5%, the specificity level was 72.7%, the PPV value was 88% and the NPV value was 61.5%. Thus, the research hypothesis can be accepted where there was no significant difference between the effectiveness of the Fecal Immunochemical Test against Colonoscopy as a screening tool for colorectal cancer.

Discussion

FIT and colonoscopy were two modalities that can be used as methods of early detection of colorectal cancer. FIT has advantages in the form of no risk of trauma to the colon because the examination is not invasive, no special preparation is needed, the sampling process is

Table 1 Characteristics of Research Subjects

	Variable	Total
Age (Years)	17-25	1
	26-35	5
	36-45	4
	46-55	9
	56-65	12
	>65 Years	7
Gender	Male	18
	Female	20
Comorbid	Yes	29
	No	9
Risk factors	Physical activity, diet	1
	Diet	5
	Hereditary factors	1
	Hereditary factors, diet	1
	Smoking	3
	Smoking and age	1
	Smoking, diet	2
	Age	6
	Age , Physical activity	4
	Age, Diet	5
	Age, Hereditary factors, diet	1
	Age, smoking	3
	Age, Smoking	4
	Age, smoking, Diet	1

Table 2 Sensitivity, Specificity, PPV and NPV of FIT and Colonoscopy Examination

Colonoscopy	FIT		Total
	Positive	Negative	
Positive	22	5	27
Negative	3	8	11
Total	25	13	38

Sensitivity	Specificity	PPV	NPV	Kappa	p-value*
81.5%	72.7%	88.0%	61.5%	0.514	0.624

*) p-value mann whitney test

easier to do and can be done at home, cheaper. In addition, a study conducted by Segnan et al. in 2007 has shown that semiquantitative FIT was more accurate than the guaiac test for detecting advanced colorectal cancer and adenoma, and this new test was now recommended as the fecal occult blood test first choice in the early detection of colorectal cancer. However, there were some limitations from FIT, such as not being able to detect certain types of polyps and cancer, it can give false positive results, The rates of false-negative and false-positive of FIT were 58.0% and 15.7%. it must be done every year and a colonoscopy should still be done if abnormal results are found.⁷

Colonoscopy on the other hand was still the gold standard in detecting colorectal cancer and was recommended as the first line for early detection because its accuracy was still higher than other tests. However, colonoscopy still has several disadvantages, including costs that are not cheap and are more invasive which in turn will reduce patient comfort and patient compliance in carrying out the examination.⁹ The balance between invasive and non-invasive examinations was considered to have an important role in increasing patient compliance for early detection for further diagnosis.^{10,11}

Although both can be used as an early detection tool and was quite sensitive in detecting colorectal cancer lesions, but fecal immunochemical test has a limited function in detecting pre-cancerous lesions compared to colonoscopy. However, if FIT is as effective as colonoscopy the use of this test as an early detection tool can reduce the cost burden significantly.^{12,13}

The results of this study were similar to those of Enrique et al. who also described that there was no significant difference between colonoscopy and FIT.⁵ Meanwhile differing results obtained in studies conducted Amanda, et al that FIT can reduce the use of colonoscopy to 71%, but can miss cases of colorectal cancer up to 30–40% of cases.¹⁴

In a study conducted by Zorzi et al. Colonoscopy was known to more accurately describe the type of cancer and the stage of cancer that occurs in patients. The results of the study stated that there were 3.9% of patients suffering from colorectal cancer, of which 24.8% had a high risk of developing an adenoma and 18.7% a low risk of developing an adenoma. As for the stage of colorectal cancer can be detected in 64.8% of patients, and obtained patients with the condition of stage I as many as 48.6%

and stage II as many as 34.5%. Limitations of this study was the site of neoplasms that are not described further even though the actual location of the neoplasm may affect the sensitivity and specificity of both the early detection tool. Colonoscopy and FIT were known to be less effective in detecting lesions located in the proximal colon than in the distal colon.^{2,15}

From the results of research on the comparison of the effectiveness of the FIT against Colonoscopy as an early detection tool for colorectal cancer, it was known that there was no significant difference between the effectiveness of the FIT against colonoscopy as a screening tool for colorectal cancer.

This study can be further developed, with more samples, more variables such as the type of lesion, whether pre-cancerous or cancerous, described in more detail and then the location of the neoplasm can also be added because the sensitivity and specificity of FIT and colonoscopy are influenced by other factors. that factor.

References

1. Basir I, Rudiman R, Lusikoy R, Lukman K, Sadiyah W, Jeo WS, et al. Panduan penatalaksanaan kanker kolorektal. Jakarta: Kementerian Kesehatan Republik Indonesia. 2016.
2. Pin Vieito N, Zarraquiños S, Cubiella J. High-risk symptoms and quantitative faecal immunochemical test accuracy: Systematic review and meta-analysis. *World J Gastroenterol.* 2019;25(19):2383–401.
3. Prentice A, Marshall S, Vance M, Choglay S, Von Wagner C, Kerrison R. Colorectal cancer screening and the role of community pharmacy. *The Pharmaceutical J.* 2019;302(1):1–11.
4. D'Souza N, Georgiou Delisle T, Chen M, Benton S, Abulafi M. Faecal immunochemical test is superior to symptoms in predicting pathology in patients with suspected colorectal cancer symptoms referred on a 2WW pathway: a diagnostic accuracy study. *Gut.* 2021;70(6):1130–138.
5. van Turenhout ST, Oort FA, van der Hulst RWM, Visscher AP, sive Droste JS, Scholten P, et al. Prospective cross-sectional study on faecal immunochemical tests: sex specific cut-off values to obtain equal sensitivity for colorectal cancer?. *BMC Gastroenterol.* 2014;14:217.
6. Siegel RL, Miller KD, Jemal A. Cancer statistics,

2016. *CA Cancer J Clin.* 2016;66(1):7–30.
7. Helsingen LM, Vandvik PO, Jodal HC, Agoritsas T, Lytvyn L, Anderson JC, et al. Colorectal cancer screening with faecal immunochemical testing, sigmoidoscopy or colonoscopy: a clinical practice guideline. *BMJ.* 2019(2);367.
 8. Nicholson BD, Thompson M, Price CP, Heneghan C, Plüddemann A. Home-use faecal immunochemical testing: primary care diagnostic technology update. *Br J Gen Pract J R Coll Gen Pract.* 2015;65(632):156–8.
 9. Zorzi M, Hassan C, Capodaglio G, Baracco M, Antonelli G, Bovo E, et al. Colonoscopy later than 270 days in a fecal immunochemical test-based population screening program is associated with higher prevalence of colorectal cancer. *Endoscopy.* 2020;52(10):871–6.
 10. Li SJ, Sharples LD, Benton SC, Blyuss O, Mathews C, Sasieni P, et al. Faecal immunochemical testing in bowel cancer screening: Estimating outcomes for different diagnostic policies. *J Med Screen.* 2021;28(3):277–85.
 11. Atkin W, Dadswell E, Wooldrage K, Kralj-Hans I, von Wagner C, Edwards R, et al. Computed tomographic colonography versus colonoscopy for investigation of patients with symptoms suggestive of colorectal cancer (SIGGAR): a multicentre randomised trial. *Lancet.* 2013;381(9873):1194–202.
 12. Moss S, Mathews C, Day TJ, Smith S, Seaman HE, Snowball J, et al. Increased uptake and improved outcomes of bowel cancer screening with a faecal immunochemical test: results from a pilot study within the national screening programme in England. *Gut.* 2017;66(9):1631–44.
 13. Steele RJ, McDonald PJ, Digby J, Brownlee L, Strachan JA, Libby G, et al. Clinical outcomes using a faecal immunochemical test for haemoglobin as a first-line test in a national programme constrained by colonoscopy capacity. *United European Gastroenterol J.* 2013;1(3):198–205.
 14. Quintero E, Castells A, Bujanda L, Cubiella J, Salas D, Lanás Á, et al. Colonoscopy versus fecal immunochemical testing in colorectal-cancer screening. *N Engl J Med.* 2012;366(8):697–706.
 15. Khan AA, Klimovskij M, Harshen R. Accuracy of faecal immunochemical testing in patients with symptomatic colorectal cancer. *BJS Open.* 2020;4(6):1180–88.