



THE RELATIONSHIP OF PHYSICAL ACTIVITY WITH THE LEVEL OF COLON CLEANLINESS IN COLONOSCOPY PATIENTS AT THE GASTROINTESTINAL ENDOSCOPY CENTER

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ABSTRACT

Colonoscopy is an examination of the colorectum and terminal ileum which is carried out by inserting a scope with a camera and a flexible light source through the anus. Colons that are still dirty or not clean, up to 20-30% of colonoscopies are reported to be canceled or rescheduled. The muscle tone of the abdomen, pelvis and diaphragm is influenced by physical activity which facilitates defecation. The aim of the study was to determine the relationship between physical activity which influences the level of colonic cleanliness in colonoscopy patients. The study involved 75 subjects who underwent colonoscopy procedure in November-December 2023 using the WHO GPAQ 2016 questionnaires and Boston Bowel Preparation Scale (BBPS). The design uses quantitative descriptive methods with cross sectional analysis. The data obtained was then subjected to statistical tests using SPSS chi-square. The test results obtained a p-value of 0.005 ($p < 0.05$). The results of this study indicate that there is a significant relationship between physical activity and colon cleanliness.

Keywords: BBPS; colonoscopy; colon cleanliness; GPAQ; physical activity

How to cite (in APA style)

Manurung, S. T. H., Lukmana, S., Lukmana, S., Setiyadi, A., & Wardani, N. S. (2024). The Relationship of Physical Activity with the Level of Colon Cleanliness in Colonoscopy Patients at the Gastrointestinal Endoscopy Center. *Indonesian Journal of Global Health Research*, 6(S5), 633-640. <https://doi.org/10.37287/ijghr.v6iS5.4441>.

INTRODUCTION

A colonoscopy is an examination of the colorectal area and terminal ileum conducted by inserting a scope with a camera and flexible light source through the anus. Since its introduction in the 1960s, colonoscopy has been a vital diagnostic and treatment tool for a number of intestinal disorders. Intestinal disorders come in numerous forms and can be categorized as follows: bleeding, tumor, inflammatory bowel disease (IBD), infectious disease, and others. Colonoscopy can detect inflammation, ulcers, neoplasms, and bleeding. In addition, it provides information about macroscopic findings and allows for tissue sampling by inserting instruments through various channels. (Hong & Baek, 2023) The accuracy of diagnostic colonoscopy requires comprehensive visualization of the colonic mucosa, making bowel preparation an important part of this procedure. Failure to properly cleanse the bowel for colonoscopy can lead to missed lesions, prolonged procedure times, and repeated procedures with shorter intervals. (Lai et al., 2009). Colon that is still in a dirty or unclean condition leads to 20-30% of colonoscopies being reported as canceled or rescheduled. This can burden patients as they have to repeat bowel cleansing and undergo colonoscopy at another time, which can impact the increase in costs for society. (Shamim et al., 2021)

The tone of the abdominal, pelvic, and diaphragm muscles is influenced by physical activity that facilitates bowel movements. The increased activity of those muscles enhances the peristaltic movement of the large intestine, making it easier to have a smooth bowel movement. In addition, as the muscles of the body become accustomed to being used for

activities, the muscles, including the smooth muscles of the large intestine, gradually lose their function. (Chu et al., 2014). In the study of bowel movement inadequacy measured by the BBPS, it was found that older age, higher body mass index (BMI), larger waist circumference, illiteracy, decreased physical activity, lower fruit and vegetable consumption, and smoking all correlated significantly. (Sadeghi et al., 2022). Walking is known to enhance bowel cleansing and reduce discomfort associated with nausea and abdominal pain during bowel preparation for colonoscopy. Although intensive walking leads to good bowel preparation quality, it is relatively difficult for patients with gait disorders, and bowel cleansing through abdominal vibration stimulation is relatively easy and has been found to yield bowel preparation results comparable to walking more than 3,000 steps. (Noh, et al., 2020)

At the Endoscopy Center of the Digestive Tract at RSUPN Dr. Cipto Mangunkusumo, from all the colonoscopy procedures conducted from January to March 2023, 20% had inadequate bowel preparation or still contained feces, necessitating a repeat bowel cleansing preparation and rescheduling for the colonoscopy procedure. This can lead to delays in the therapy provided, extending the time patients need to spend on a procedure, and increasing the costs incurred. This includes both the expenses for the procedure itself and those related to transportation to the hospital. The purpose of this research is a the relationship between physical activity and level of colon cleanliness in patient undergoing colonoscopy at the gastrointestinal endoscopy center of Dr Cipto Mangunkusumo General Hospital.

METHOD

This quantitative research uses descriptive quotes that correlate with a cross-sectional approach. The sampling methods used in this study are time limited sampling and accidental sampling. The time limited sampling method is employed during a specified period, from November to December 2023. The first instrument used in this study is the GPAQ Questionnaire, created by the WHO (World Health Organization), which is used to assess and evaluate physical activity and is the standard questionnaire from WHO 2016. The second instrument (Colon Cleanliness on colonoscopy results) corresponds to the BBPS (Boston Bowel Preparation Scale) for colon cleanliness, which consists of 3 segments. These are the right colon segment, the transverse colon, and the left colon, which can be observed after the complete colonoscopy procedure. Bivariate analysis is used to determine the relationship between the physical activity of the studied variable, specifically the physical activity of patients in the 7 days prior to the colonoscopy, and the level of colon cleanliness. The variable of physical activity is the independent variable, while the level of colon cleanliness is the dependent variable. The measurement scale of both variables is ordinal, so the statistical test used is chi-

RESULT

The researchers presented and explained the findings of this study, which involved 75 respondents and was conducted from November to December 2023 at the Endoscopy Center of the Dr. Cipto Mangunkusumo General Hospital in Jakarta.

Table 1 above, it shows that 14.67% of participants are aged 19-25 years, 10.67% are aged 26-32 years, 14.67% are aged 33-39 years, 10.67% are aged 40-46 years, 18.67% are aged 47-53 years, 8% are aged 54-60 years, and 22.67% are aged 61-67 years. The respondents who are male make up 38.7%, while those who are female account for 61.3%. The education level of the respondents indicates that 13.3% have completed elementary school, 6.7% have completed junior high school, 45.3% have completed high school, 12% have a diploma,

17.3% have a bachelor's degree, and 5.3% have a master's degree. The percentage of respondents showing light activity is 42.7%, moderate activity is 24%, and heavy activity is 33.3%. Respondents with poor BBPS account for 21.3%, those with good BBPS make up 22.7%, and respondents with very good BBPS comprise 56%.

Table 1.
Frequency Distribution of Respondents by Age

Characteristics	f	%
Age Interval		
19-25	9	14,67
26-32	10	10,67
33-39	8	14,67
40-46	9	10,67
47-53	13	18,67
54-60	8	8
61-67	18	22,67
Gender		
Male	29	38,7
Female	46	61,3
Education		
Elementary	10	13,3
Junior High School	5	6,7
Senior High School	34	45,3
Diploma	9	12
Bachelor	13	17,3
Masteral	4	5,3
Physical Activity		
Light	32	42,7
Moderate	18	24
Heavy	25	33,3

Table 2.
Cross Table of Physical Activity and Colon Cleanliness in Patients Undergoing Colonoscopy at the Gastrointestinal Endoscopy Center

Physical Activity	BBPS								Total		P-Value
	Bad		Good		Very Good						
	f	%	f	%	f	%	f	%			
Light	13	40.6	6	18.8	13	40.6	32	100	0.005		
Moderate	3	16.7	3	16.7	12	66.7	18	100			
Heavy	0	0	8	32	17	68	25	100			

Table 2, it can be seen that respondents with light physical activity and poor colon cleanliness accounted for 40.6%, those with light physical activity and good colon cleanliness made up 18.8%, and those with light physical activity and very good colon cleanliness also represented 40.6%. Respondents with moderate physical activity and poor colon cleanliness were 16.7%, those with moderate physical activity and good colon cleanliness were 16.7%, and those with moderate physical activity and very good colon cleanliness comprised 66.7%. For respondents with heavy physical activity, there were 0% with poor colon cleanliness, 32% with good colon cleanliness, and 68% with very good colon cleanliness. From the table, it was also found that the total number of respondents with poor colon cleanliness was 21.3%, with good colon cleanliness was 22.7%, and with very good colon cleanliness was 56%. The results of the chi-square statistical test were obtained to determine the relationship between physical activity and colon cleanliness. The study results showed a p-value of 0.005 ($p = 0.05$). The research results indicate that there is a significant correlation between activity and colon cleanliness.

DISCUSSION

Univariate Analysis

Based on the distribution of respondents by age of patients undergoing colonoscopy, out of 75 respondents, the least represented age group was 54-60 years, accounting for 8%. The age groups of 26-32 years and 40-46 years ranked as the second smallest, each with 10.67%, followed by the age groups of 19-25 years and 40-46 years at 14.67%. Next, respondents in the 47-53 year age group made up the second largest percentage at 18.67%, while the largest number of respondents was found in the 61-67 year age group, which constituted 22.67% of the total. A colonoscopy can be performed for various reasons. This can be divided into diagnostic and therapeutic indications. The next diagnostic indications can be classified into two categories: screening and elective. Colonoscopy screening is conducted to assess colorectal cancer based on the patient's risk. For patients with a colonoscopy that shows no findings or with normal results and no identified pathology, average-risk screening begins at age 50 and is performed at least every 10 years. Patients will undergo repeat colonoscopy at 10-year intervals to continue screening for colorectal cancer or precancerous lesions. (Stauffer & Pfieffer, 2023).

Research by Audibert et al. (2017) mentions colonoscopy procedures in 5 countries (France, Germany, the UK, the US, and Japan) based on patient age groups (<50 years, 50–64 years, 65–75 years, >75 years). 59%–73% of colonoscopies were performed on patients aged between 50 and 75 years, 15%–23% on patients under 50 years, and 14%–21% on patients over 75 years. Indications for performing early colonoscopy among patient age groups based on the country. In France, Germany, and America, the main reasons for undergoing the first colonoscopy vary by age group. Among patients under 50 years old and those aged 50 to 64, abdominal complaints are the primary reason for the procedure. The second most common reason for the first colonoscopy in this age group in the same countries is colorectal cancer screening. Among patients aged 65-75 years, colorectal cancer screening is the primary reason for undergoing the first colonoscopy. For patients over 75 years old, abdominal pain and colorectal cancer examination are the main reasons for this procedure. In the characteristics of the respondents' age in this study, the majority of respondents are in the age range of 61-67 years. This is consistent with previous research, specifically the studies conducted by Stauffer & Pfieffer (2023) and Audibert (2017). Stauffer & Pfieffer state that patients who undergo colonoscopy the most are those over 50 years old due to colorectal cancer screening, which is performed every 10 years after the age of 50. Meanwhile, another study conducted in 5 different countries indicates that the most common age range is between 50 and 75 years. (Audibert et al., 2017)

The majority of respondents are women, accounting for 61.3%. Among the female respondents, 17.4% have poor nutritional status, 21.7% have good nutritional status, and 60.9% have very good nutritional status. Women's sex hormones have been recognized as an important factor that modulates vulnerability to stress, gut motility, and visceral pain perception through interactions with the neuromodulator system and the emotional system. Women are also known to have slower gastrointestinal transit compared to men. Irritable bowel syndrome (IBS) occurs more frequently in women than in men. In terms of symptoms, women are more likely to complain of abdominal pain and constipation-related symptoms, while men more often report diarrhea-related symptoms. (Kim Y.S & Kim N, 2018). In the study by Park et al. (2023), women reported more complaints of abdominal pain, and there was a correlation with the occurrence of post-infection IBS. This indicates that gender differences significantly affect the sensitivity of perception towards rectosigmoid distension. Several studies focus on the role of estrogen as a cause of this difference. In terms of the

gender characteristics of this study, it is in line with previous research. Whereas women undergo colonoscopy procedures more frequently due to hormonal factors, women with IBS experience constipation more often than men with IBS. Research by Park et al. also states the same, that women are more likely to be affected by IBS. Therefore, many patients undergo colonoscopy examinations related to this issue.

The majority of respondents have a high school education, accounting for 45.3%, compared to other levels of education. The existing research on the relationship between education and health essentially discusses two aspects of the issue. First, experts examine whether education will improve individual health and the overall mechanisms involved. Some experts believe that higher education levels will improve the health of the population.(Long et al., 2020). The research results of Donovan et al. (2021) indicate a significant influence of patients' education levels on compliance and the success of colonoscopy preparation. The adequacy of colon preparation occurs in the high school education group. Patients may mistakenly believe that they have correctly completed the colon preparation. A study conducted by Al-Dahshan et al. (2023) on the general public in the western region of Saudi Arabia found that education level plays a significant role in awareness levels. This is supported by previous research, where participants with higher education levels were found to have a greater knowledge of the warning signs of Colorectal Cancer (CRC). The study conducted by Knudsen et al. (2020) is the first to combine public attitudes towards CRC screening, awareness of lifestyle risk factors for CRC, and preferences for cancer prevention information. Education level is linked to knowledge about CRC risk factors. The characteristics of respondents in this study indicate that the majority have a high school education. Several of the aforementioned studies mention that education level affects knowledge levels, thereby increasing self-awareness regarding their health. Knudsen's research states that low knowledge levels are caused by lower education levels, resulting in limited knowledge about CRC risk factors. Cuihong Long's research in 2020 also stated that the same health investment would yield higher outputs for groups with higher education compared to those with lower education. In this research, high school education is indeed not the highest level of education in Indonesia, but high school education is considered to have an understanding of the education provided by various media regarding the importance of health and the risks arising from certain symptoms.

Bivariate Analysis

Physical Activity and Colon Cleanliness in Patients Undergoing Colonoscopy at the Endoscopy Center

It appears that respondents with light physical activity and poor colon cleanliness make up 40.6% of the total 32 respondents with light physical activity. Meanwhile, among respondents with moderate activity, there is 16.7% from a total of 18 respondents with moderate activity levels. Respondents with heavy physical activity and very good colon cleanliness account for 68% of the 22 respondents with heavy physical activity, and none of the respondents with heavy physical activity had poor colon cleanliness. From the results of the chi-square statistical test to determine the relationship between physical activity and colon cleanliness at the Endoscopy Center of the Dr. Cipto Mangunkusumo General Hospital. The test results yielded a p-value of 0.005 ($p < 0.05$). The results of this study indicate that there is a significant relationship between activity and colon cleanliness.

Physical activity mechanically accelerates the transfer of chemicals from the stomach to the rectum, which reduces the impact of constipation. The coordinated contraction and relaxation of muscles, fueled by energy obtained from diet, is known as physical activity. The peristaltic movement of the large intestine affects the movement of the abdominal, pelvic, and

diaphragm muscles. With good intestinal peristalsis, the defecation cycle will proceed more smoothly. Bowel movement is controlled by physical activity, which includes reducing colon transit time and altering hormones. (Sugiantoro et al., 2023). Physical activity can enhance the mechanical stimulation of the intestines due to gravity, the pushing force when jumping or running, and the stimulation of the muscles around the abdomen. (Sadeghi et al., 2022). According to Zhang et al. (2020), systematic reviews and meta-analyses provide specific evidence that walking exercise during bowel preparation can enhance the adequacy of bowel preparation speed and reduce the incidence of vomiting and abdominal pain in patients undergoing colonoscopy.

The main reason is that walking can improve blood circulation in the digestive organs. By increasing the secretion of digestive glands and the movement of the digestive tract, this can accelerate the absorption and excretion of bowel cleansing agents, thereby significantly improving patient tolerance and comfort during bowel preparation. In Gao's (2022) study on the Effects of Walking Exercise and Interval Bowel Cleansing on Colon Preparation Quality, there were three groups: the 0-step group, the 5,000-step group, and the 10,000-step group. The colon preparation quality in the 10,000-step group was significantly higher compared to the other groups. The interval for bowel cleansing (<5.12 hours) is only effective on the right and left colon BBPS. Gao (2022) suggests that participants engage in a 10,000-step walking exercise and consume PEG 5.12 hours before the procedure, which is effective for routine pre-procedural cleansing for standard colonoscopy. The research conducted by Noh (2020) on the Comparison of the Effectiveness of Abdominal Vibration Stimulation and Walking Exercises for Bowel Cleansing Before Colonoscopy Therapy is the first study that describes the validity and utility of abdominal vibration stimulation versus walking exercises to improve the quality of bowel preparation for colonoscopy. Although intensive walking results in good bowel preparation quality, it is relatively difficult for patients with gait disorders, and bowel cleansing with abdominal vibration stimulation is relatively easy and has been found to yield bowel preparation results equivalent to walking more than 3,000 steps. Bowel preparation with abdominal vibration stimulation can help achieve adequate bowel cleansing in patients who are unable or unwilling to perform walking exercises or in patients with neurological diseases who may be susceptible to prolonged sedation.

The results of this study are in line with previous research, where physical activity plays an important role in the process of colon cleanliness. Like the research conducted by Sadeghi et al. (2022), which states that the driving force while jumping or running, along with stimulation of the muscles around the abdomen, physical activity can enhance the mechanical stimulation of the intestines. Research by Noh (2020) also indicates that the effectiveness of walking and abdominal vibration stimulation can aid in adequate bowel cleansing. This is supported by research from Sugiantoro et al. (2023) which indicates that physical activity mechanically accelerates the transfer of substances from the stomach to the rectum, reducing the effects of constipation. This condition is related to a decrease in the number of calories consumed during old age, but it is not related to the amount of fluids or fiber consumed. Physical activity is the process of coordinated muscle contraction and relaxation that utilizes energy from the diet. The movement of the abdominal, pelvic, and diaphragm muscles is influenced by the peristaltic movement of the large intestine. The defecation cycle will be smoother with good intestinal peristalsis.

CONCLUSION

Based on the results of this study, the conclusions drawn are as follows: The majority of respondents engaged in light physical activity were 32 individuals (42.7%), respondents with

moderate physical activity numbered 18 individuals (24%), and respondents with heavy physical activity totaled 25 individuals (33.3%). It identifies that the level of colon cleanliness, indicated by poor BBPS, was found in 16 individuals (21.3%), respondents with good BBPS were 17 individuals (22.7%), and respondents with very good BBPS were 42 individuals (56%). Chi-square statistical test of the relationship between physical activity and colon cleanliness at the Endoscopy Center of the Dr. Cipto Mangunkusumo General Hospital. The test results yielded a p-value of 0.005 ($p < 0.05$). The results of this study indicate that there is a significant relationship between physical activity and colon cleanliness. This research has several limitations. These limitations can arise from the researchers themselves or from the instruments used. In this study, only the variable of physical activity related to colon cleanliness in patients undergoing colonoscopy was examined. There are still many other variables that can be studied related to colon cleanliness. The physical activities conducted by the researchers are still broad and global; for more specific physical activities such as walking interventions, cycling, or others, further research can be carried out. The variable of physical activity assessed in the research requires highly supportive and accurate data. One of them is compliance with the colon cleansing regimen, which must also be directly observed. In this study, it was not possible to directly and objectively observe the cleansing regimen.

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