Relationship between health literacy and quality of colonoscopy bowel preparation

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ABSTRACT

Background/Aims: *There are a variety of factors that affect the quality of colonoscopy bowel preparations, although the relationship between the level of health literacy (HL) and the quality of bowel preparations has yet to be clarified. The present study evaluated the effect of HL on the quality of bowel preparation prior to a colonoscopy.*

Materials and Methods: *The data of 150 patients who underwent a colonoscopy for colorectal cancer screening and in whom the quality of bowel preparation was scored during the colonoscopy were recorded prospectively. The European Health Literacy Survey Questionnaire (HLS-EU-Q47) was used to evaluate HL prior to the colonoscopy, and the Boston bowel preparation scale was used to evaluate the quality of the bowel preparation during the colonoscopy. The demographic characteristics of the patients, the presence of comorbidities, socioeconomic characteristics (marital status, income level, and educational level), HLS-EU-Q47 questionnaire, and Boston bowel preparation scale scores were recorded and evaluated.*

Results: *A significant linear relationship was identified between the general HL index score, the cleanliness of the colonic segments (right, transverse, and left colon) and the total Boston bowel preparation scale score (p=0.013, p=0.010, p=0.008, p=0.001, respectively). In a HL subgroup analysis, a significant linear relationship was noted between disease prevention and health promotion index, the cleanliness of the colonic segments (right, transverse, and left colon), and the total Boston bowel preparation scale score. It was observed that an increase in the health care index resulted in an increase in the cleanliness of the relevant colonic segments and the total Boston bowel preparation scale score. No relationship was found between the right, transverse, and left colon and the total Boston bowel preparation scale scores and gender, age, Body Mass Index (BMI), comorbidity, marital status, level of income, or educational level.*

Conclusion: *The level of HL affects the quality of colonoscopy bowel preparations.*

Keywords: *Health literacy, HLS-EU-Q47, bowel preparation, colonoscopy*

INTRODUCTION

Colonoscopy is a standard procedure used in the diagnosis and treatment of benign and malignant lesions through direct observation of the colonic and rectal mucosa. The effectiveness of a colonoscopy is dependent upon the experience of the endoscopist and the quality of the bowel preparation (1, 2). An incomplete colonoscopy is defined as a failure of the cecal intubation and an ineffective visualization of the colonic mucosa, the rate of which varies between 10% and 20% (3). Insufficient bowel preparation is the most common cause of incomplete colonoscopies (10%-30%) (4-6). A poor line of communication between the patient and the physician, living alone and/or being an inpatient, history of incomplete colonoscopy, long waiting list, polypharmacy (i.e., opiates), obesity, advanced age, male gender, and presence of comorbidities, such as diabetes mellitus, stroke, dementia, and Parkinson's disease, unfavorably affect the quality of bowel preparations (7-9).

Health Literacy (HL) is defined as the ability of an individual to obtain, understand, and process basic health information and the services required to make appropriate decisions, and so to develop appropriate behavior (10). Cultural background and economic status, as well as demographic characteristics, such as age and educational level, also affect the level of HL (11). The level of HL has been found to be associated with the patient's understanding of the complex colonoscopy preparation process and medical preparations, the ability to follow a diet, sufficient bowel preparation, and the completion of a colonoscopic screening program (4,9,12,13,14).

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There is a limited body of knowledge related to the relationship between colonoscopy bowel preparation and HL. The present study evaluates the effect of HL on the quality of the colonoscopy bowel preparation.

MATERIALS AND METHODS

Study Design

The data of 150 patients who underwent a colonoscopy for colorectal cancer screening in the department of general surgery of Bursa Yuksek Ihtisas Training and Research Hospital between January 2019 and April 2019 and in whom the quality of bowel preparation was scored during a colonoscopy were recorded prospectively. Detailed information about the study was provided to the patients and their written informed consent was obtained. The study was conducted in accordance with the principles of the Helsinki Declaration. The local ethics committee approved the study (Decision Date:02.01.2019, Decision No:2011-KAEK-25 2019/01-06).

Study Sample

Included in the study were literate outpatients aged 18–70 years with no previous history of abdominal or colonic surgery. Patients who declined to participate in the survey, illiterate patients, healthcare professionals, patients with chronic constipation, patients undergoing colonoscopy under emergency conditions, patients with a past history of multiple colonoscopies, and patients in whom the procedure could not be continued due to an unprepared bowel at the beginning of the colonoscopy were excluded from the study. The colonoscopies were performed in a single center and by the same endoscopist. For bowel preparation, all patients were put on a low-fiber diet for two days prior to the procedure, along with a polyethylene glycol solution in separated doses, prior to the procedure. All colonoscopic interventions were performed in the endoscopy unit under sedoanalgesia.

Interventions

The cleanliness of the right, transverse, and left colon was scored between 0 and 3 points during the colonoscopy, based on the Boston bowel preparation scale (total 9 points) (15). A score of <6 indicated insufficient or poor, a score of 6-8 indicated good, and a score of 9 indicated excellent bowel preparation.

The European Health Literacy Survey Questionnaire (HLS-EU-Q47) was used to evaluate the level of HL (16). The questionnaire forms were filled out using a face-to-face interview technique in the outpatient clinics prior to the colonoscopy. The 47 items were rated on a 4-point scale, and the options were sorted in the following order: 1=very difficult, 2=difficult, 3=easy, 4=very easy. Unanswered questions were not rated. The items in the questionnaire were divided into three subgroups: items 1-16 related to health care; items 17–31 related to disease prevention; and items 32-47 related to health promotion. A score of 0–24 indicates inadequate HL (HL); a score of 25-32 indicates problematic HL; a score of 33-41 indicates adequate HL; and a score of 42-50 indicates excellent HL (Formula Index = (M-1)*(50/3), where the index was a specific calculated index, M was the mean of all participating items for each individual, 1 was the minimal possible value of the mean, 3 was the range of the mean, and 50 was the chosen maximum value of the new metric (16)).

Patient demographic characteristic, socioeconomic characteristics (marital status, income level, and educational level), presence of comorbidities, Boston bowel preparation scale score, and HLS-EU-Q47 questionnaire scores were recorded and evaluated.

Statistical Analysis

Shapiro Wilk test was used to test whether the variables were normally distributed. Continuous variables were expressed as median (minimum:maximum), and categorical variables were expressed as number and percentage. Mann-Whitney U-test or Kruskal Wallis test were used to compare the general HL scores of the groups. Dunn test was used in subgroup analysis if the Kruskal Wallis test showed general statistical significance. Correlations between bowel preparation scores and HLI total and subscale scores were evaluated with correlation analysis, and Spearman's correlation coefficient was calculated. The Statistical Packages for the Social Sciences (SPSS) released 2012, version 21.0. (IBM Corp.; Armonk, NY, USA) software package was used for the statistical analysis and a p value <0.05 was considered statistically significant.

MAIN POINTS

- *A variety of factors can affect the quality of colonoscopy bowel preparations, with health literacy (HL) level being one such factor.*
- *The quality of bowel preparations can be improved by determining the HL level of the patient prior to bowel preparation and the provision of education in the process to patients with low–limited HL levels.*

RESULTS

Included in the study were 150 patients. No complications occurred in any of the patients during or after the

Table 1. HL level based on HLS-EU-Q47 questionnaire scores.

Score	HL level (n=150)
Inadequate (0-25)	39 (26%)
Problematic-limited (>25-33)	62 (41.30%)
Sufficient (>33-42)	35 (23.30%)
Excellent (>42-50)	14 (9.30%)

Data is expressed as n (%).
HL: health literacy.

Table 2. Demographic and socioeconomic characteristics of patients.

	n=150	General HL index Median (min:max)
Age (years)	rs	-0.08
	p	0.357
Gender	Female (n=89)	26.26 (0:50)
	Male (n=61)	31.21 (5.56:50)
	p	0.037[a]
BMI	rs	0.03
	p	0.762
Comorbidity	Present (n=73)	29.43 (0:50)
	Absent (n=77)	30.50 (6.16:50)
	p	0.576a
Marital Status	Married (n=122)	30.14 (0:50)
	Other (n=28)	31.90 (7.25:49.29)
	p	0.423[a]
Level of Income	Low (n=14)	22.93 (7.25:42.80)
	Moderate (n=117)	30.14 (0:50)
	High (n=19)	33.33 (6.16:47.83)
	p	0.017[b]
Level of Education	Primary school (n=106)	28.94 (0:50)
	High school (n=34)	33.33 (7.25:50)
	University (n=10)	33.33 (23.19:46.67)
	p	0.002[b]

Data is presented as median (minimum:maximum), mean ± standard deviation, n (%).
a: Mann-Whitney U-test, b: Kruskal Wallis test, rs: Spearman's correlation coefficient.
HL: health literacy; BMI: Body Mass Index.

colonoscopy. The level of HL was insufficient or limited in 67.3% and sufficient or excellent in 32.6% of the patients, according to the HLS-EU-Q47 questionnaire results (Table 1). The internal consistency of the HL scale was evaluated using Cronbach's alpha. The reliability coefficient was α=0.89 for health care, α=0.92 for disease prevention, and α=0.95 for health promotion, and the overall reliability coefficient was α=0.97.

The relationship between the level of HL and the demographic characteristics of the patients, the presence of comorbidities, marital status, and income and education levels were evaluated (Table 2). No significant relationship was found between age (56 (18:70)), Body Mass Index (BMI), presence of comorbidities, marital status, and general HL. The general HL index varied according to gender, and the median HL index was higher in males than in females. The general HL index varied according to the level of income. In a subgroup analysis, the general HL index was significantly higher in patients with a high-income level than in patients with a poor-income level (p=0.014). No significant difference was identified between the patients with moderate- and good-income levels (p=0.442). The general HL index did not differ significantly between patients with poor and moderate levels of income (p=0.071). The general HL index varied according to educational level. In subgroup analysis, the general HL index was significantly higher in patients with a high-school level of education than in patients with a lower educational level (p=0.004); however, the general HL index did not differ significantly between patients with an education level beyond high school and those with a high-school or lower level of education (p>0.99 and p=0.177, respectively).

The relationship between the Boston bowel preparation scale scores and the general and subgroup HL indices was analyzed (Table 3). A linear relationship was noted between the health care subscale of the HL index and transverse, left colon, and total bowel preparation scores. It was observed that an increase in the health care index resulted in an increase in the bowel preparation scale score, while no significant relationship was found between the health care index and cleanliness score of the right colon. A significant linear relationship was noted between the disease prevention and health promotion indices and the cleanliness of colonic segments (right, transverse, and left colon) and the total Boston bowel preparation scale score, and a significant linear relationship was found between the general HL index and the cleanliness of colonic segments (right, transverse, and left colon) and the total Boston bowel preparation scale score (Figure 1).

Table 3. Relationship between bowel preparation scale scores and health literacy index.

	Health care index (Q1-16)		Disease prevention index (Q17-31)		Health promotion index (Q32-47)		General HL index (Q1-47)	
n=150	rs	p	rs	p	rs	p	rs	p
Cleanliness of right colon	0.13	0.117	0.21	0.009	0.21	0.012	0.20	0.013
Cleanliness of transverse colon	0.17	0.038	0.21	0.009	0.19	0.022	0.21	0.010
Cleanliness of left colon	0.24	0.003	0.18	0.025	0.20	0.015	0.21	0.008
Total bowel preparation score	0.21	0.010	0.25	0.002	0.25	0.002	0.26	0.001

rs: Spearman's correlation coefficient; HL: health literacy.

Table 4. Relationship between bowel preparation and sociodemographic data.

	n=150	Cleanliness of right colon	Cleanliness of transverse colon	Cleanliness of left colon	Total bowel preparation score
Age (years)	rs	0.01	-0.08	-0.06	-0.06
	p	0.982	0.329	0.501	0.501
Gender	Female (n=89)	2 (0:3)	2 (0:3)	2 (0:3)	6 (0:9)
	Male (n=61)	2 (0:3)	2 (0:3)	3 (0:3)	7 (1:9)
	p	0.537[a]	0.310[a]	0.282[a]	0.272a
BMI	rs	0.05	0.09	0.04	0.06
	p	0.570	0.300	0.600	0.492
Comorbidity	Present (n=73)	2 (0:3)	2 (0:3)	3 (0:3)	7 (0:9)
	Absent (n=77)	2 (0:3)	2 (0:3)	2 (0:3)	6 (2:9)
	p	0.890[a]	0.741[a]	0.531[a]	0.866[a]
Marital Status	Married (n=122)	2 (0:3)	2 (0:3)	2 (0:3)	6 (0:9)
	Other (n=28)	2 (0:3)	2 (0:3)	3 (1:3)	7 (2:9)
	p	0.233[a]	0.717[a]	0.324[a]	0.944[a]
Level of Income	Low (n=14)	2 (0:3)	2 (1:3)	2 (0:3)	6.50 (2:9)
	Moderate (n=117)	2 (0:3)	2 (0:3)	2 (0:3)	6 (0:9)
	High (n=19)	2 (0:3)	2 (0:3)	3 (0:3)	7 (1:9)
	p	0.283[b]	0.983[b]	0.669[b]	0.568[b]
Level of Education (School)	Primary (n=106)	2 (0:3)	2 (0:3)	2 (0:3)	6 (0:9)
	High (n=34)	2 (0:3)	2.50 (0:3)	2.50 (1:3)	7 (2:9)
	University (n=10)	2 (1:3)	2 (2:3)	3 (2:3)	7 (5:9)
	p	0.542[b]	0.100[b]	0.336[b]	0.187[b]

Data is presented as median (minimum:maximum) and number (%).
a: Mann-Whitney U-test, b: Kruskal Wallis test, rs: Spearman's correlation coefficient; BMI: Body Mass Index.

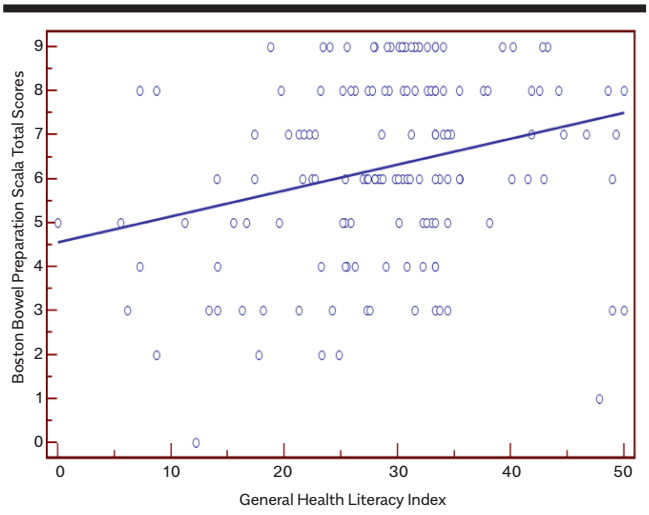

Figure 1. Boston bowel preparation scale total scores and general health literacy index.

The relationship between bowel preparation and the demographic data of the patients, the presence of comorbidities, and socioeconomic characteristics (marital status, educational level, and income level) was evaluated (Table 4). No relationship was found between the right, transverse, left colon and the total Boston bowel preparation scale scores and gender, age, BMI, comorbidity, marital status, level of income, or education level.

DISCUSSION

It was found that HL was in general low among the patients in the present study (insufficient and limited in 67.3% and excellent in 32.6%). The level of HL varies across countries, with inadequate and problematic-limited levels ranging between 7% and 48% (17-19).

The present study found that both the general HL index and the sub-dimension scores (health care, disease prevention, and health promotion index) affected both total and segmental (right, transverse, left) bowel preparation. An increase in the scores of the health care dimension of the index results was noted to result in an increase in bowel preparation score. A low HL index was shown to be associated with a decrease in understanding of health information, poor compliance with screening recommendations, impairment in health outcomes, and an increase in costs (20). It has been stated that patients with a low HL level may experience difficulties in understanding complex bowel preparation procedures prior to a colonoscopy, and that the level of HL may therefore be related to the level of bowel preparation (9,21). The present study identified a relationship between bowel preparation and HL by means of a statistical analysis and showed that a high HL index positively affected the level of bowel preparation.

The present study identified no relationship between bowel preparation scores (right, transverse, left, total) and age, BMI, gender, presence of comorbidities, or marital status. No relationship was found between age, BMI, presence of comorbidities, marital status, or general HL index. The general HL index was higher in male patients in the present study. There have been numerous studies in the literature reporting a relationship between insufficient bowel preparation and male gender, advanced age, obesity, the presence of comorbidities, and medical insurance problems (7,8,9,22). It has been stated that older people have a poorer understanding of the documents informing of bowel preparation procedures, and that a low HL level is an independent factor (21). However, the present study found no relationship between these factors and the level of bowel preparation and that HL level emerged as the main factor affecting the level of bowel preparation.

Educational level and HL level were found to be independent factors for the understanding of endoscopic procedures and ensuring sufficient bowel preparation (23). It has been shown that education level and income level are important factors in the ability of patients to understand written procedures and compliance, that application guides are not well understood prior to a colonoscopy, and that patient education improves the quality of bowel preparations (2,21,24). It has also been shown that the use of documents written in layman's terms and the use of visual materials and booklets improves the outcomes of bowel preparation (25). The health insurance system in Turkey offers free-of-charge healthcare services, and the level of income does not affect the demand for colonoscopies. Although HL index was found to be higher among patients with a higher educational level and with a higher level of income, no relationship was found between these factors and the level of bowel preparation.

Limitations

The single-center study design, the relatively small number of patients, despite the prospective study design, and the variety of HL levels across countries can be cited as limitations of this study.

In conclusion, a variety of factors can affect the quality of colonoscopy bowel preparations, with HL being one such

factor. The quality of bowel preparations can be improved by determining the HL level of the patient prior to bowel preparation and the provision of education in the process to patients with low-limited HL levels. The authors consider that there is a need for studies involving larger numbers of patients evaluating short-term and long-term outcomes so as to determine the effects of HL on bowel preparation.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Bursa Yuksek Ihtisas Teaching and Research Hospital (Decision Date:02.01.2019, Decision No:2011-KAEK-25 2019/01-06).

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

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