Patient Preference and Adherence

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ORIGINAL RESEARCH

Knowledge, Attitudes, and Practices Among Patients Undergoing Gastrointestinal Endoscopy in the Endoscopy Unit of a Tertiary-Care Hospital

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Purpose: Gastrointestinal endoscopy is a crucial diagnostic and therapeutic tool, but patients' perspectives and preparation can significantly impact procedure outcomes. Understanding patient knowledge, attitudes, and practices (KAP) is crucial for improving the quality of care in gastrointestinal procedures, fostering informed consent, and enhancing patient outcomes. Our objective was to assess the KAP regarding gastrointestinal endoscopy in the Endoscopy Unit among those referred for diagnostic procedures.

Patients and Methods: Patients scheduled for gastrointestinal endoscopy completed self-administered questionnaires to gather demographic information and evaluate their KAP scores. A total of 612 valid questionnaires were collected, 308 of which were filled out by male respondents (50.33%), with a mean age of 51.11 ± 12.61 years.

Results: The mean KAP scores were 11.66 ± 3.95 (knowledge), 29.79 ± 3.27 (attitude), and 36.69 ± 4.99 (practice). Weak to moderate positive correlations were observed between knowledge, attitudes, and practices (knowledge-attitudes: $r = 0.281$, $P < 0.001$; knowledge-practices: $r = 0.148$, $P < 0.001$; attitudes-practices: $r = 0.370$, $P < 0.001$). According to structural equation modeling, knowledge directly impacted attitude ($\beta = 0.397$, $P = 0.026$), and attitude influenced practice ($\beta = 0.402$, $P = 0.007$). Knowledge indirectly affected practice via attitude ($\beta = 0.159$, $P = 0.014$).

Conclusion: Patients demonstrated limited knowledge but exhibited positive attitudes and engaged in proactive practices regarding gastrointestinal endoscopy. These results highlight the importance of enhanced patient education programs in Endoscopy Units to improve knowledge and ensure informed decision-making regarding endoscopic procedures.

Keywords: knowledge, attitude, practice, gastrointestinal endoscopy, endoscopy unit, cross-sectional study

Introduction

Globally, diseases of the digestive system, including functional gastrointestinal disorders, gastritis, and peptic ulcers, are common and contribute significantly to both morbidity and mortality.[1] Chronic gastritis affects over half of the world's population, underscoring its widespread impact.[2] Epidemiological studies suggest that the morbidity rate for peptic ulcers and associated disorders could be as high as 10%; however, recent years have shown a declining trend in incidence, particularly due to improved H. pylori eradication strategies and proton pump inhibitor use.[3,4] The burden of gastrointestinal diseases remains high due to the prevalence of both benign conditions, such as acute and chronic gastroenteritis, and malignant diseases like colorectal and gastric cancers, which, while distinct, also represent major global public health concerns. These cancers rank as the third and fourth most common cancers globally, each causing approximately

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800,000 deaths annually.[5,6] These conditions lead to considerable pain and disability, while also placing a heavy financial strain on both families and society.

Gastrointestinal endoscopy represents the gold standard for diagnosing and monitoring digestive diseases. While primarily performed under conscious sedation, this procedure can provoke significant anxiety and psychological distress in patients, potentially affecting both procedure outcomes and patient compliance with future screening recommendations.[7] Despite its clinical benefits, gastrointestinal endoscopy can provoke anxiety, fear, and even stress reactions among patients, as reported in numerous studies.[8,9] Endoscopy is primarily utilized in outpatient settings and is well-known for its effectiveness in diagnosing and treating gastrointestinal disorders.[10] Given the increasing global incidence of digestive system diseases, the role of endoscopy is more critical than ever.[11,12]

The KAP framework provides a structured approach to understanding how patients' knowledge influences their attitudes and subsequent health behaviors. In the context of gastrointestinal endoscopy, this understanding is particularly crucial as patient preparation and cooperation directly impact procedure quality and diagnostic yield. It is based on the idea that knowledge has a beneficial effect on attitudes, which in turn influence behaviors.[13,14] Inadequate knowledge and negative attitudes may lead to poor bowel preparation, increased anxiety, refusal to undergo the procedure, or reduced compliance with follow-up recommendations-factors that can significantly compromise diagnostic accuracy and therapeutic outcomes.[9,15] With the increasing prevalence of gastrointestinal disorders, ranging from benign conditions such as gastritis to life-threatening cancers, there is a critical need to understand patient experiences and behaviors to enhance clinical outcomes. Gastrointestinal endoscopy, an essential diagnostic and therapeutic tool, often triggers anxiety and fear among patients, potentially affecting their willingness to undergo necessary procedures. This study is pivotal as it focuses on a patient group whose insights are crucial for the efficacy of endoscopic procedures and overall treatment success. By examining patients' understanding, reactions, and adjustments post-endoscopy, healthcare providers can develop targeted communication strategies and support mechanisms that enhance patient comfort, increase engagement, and promote adherence. This approach ultimately leading to optimized healthcare resource utilization and improved health outcomes.

Despite extensive research on the technology and effectiveness of endoscopy,[16–18] studies delving into patient feedback post-examination remain limited. A recent narrative review by Minciullo et al (2022) summarized available tools for assessing patient satisfaction in digestive endoscopy, emphasizing its importance as a quality indicator.[19] While that review primarily focused on satisfaction measurement, our study explores patients' KAP, offering a broader behavioral and cognitive perspective that complements satisfaction-based evaluations. This study aimed to quantify patients' knowledge levels regarding gastrointestinal endoscopy procedures; assess attitudes and psychological barriers towards endoscopic examination; evaluate adherence to pre- and post-procedure care instructions; and examine the connections between knowledge, attitudes, and practices to identify targeted intervention opportunities. These specific objectives will help address the current gap in understanding patient perspectives and guide the development of evidence-based educational programs. Therefore, herein, we sought to explore the KAP of patients toward gastrointestinal endoscopy in the Endoscopy Unit.

Materials and Methods

Study Design and Participants

The required sample size was estimated using the formula for cross-sectional studies:[20] $n = Z^2 \times P \times (1 - P) / d^2$, where n is the sample size, Z is the standard normal deviate at 95% confidence level ($Z = 1.96$), P is the expected proportion (assumed to be 50% for maximum variability), and d is the margin of error (set at 4%). Based on this formula, a minimum sample size of 384 was required. Considering potential non-response or invalid submissions, we distributed a larger number of questionnaires. Ultimately, 612 valid responses were obtained, meeting the minimum statistical power requirement.

This cross-sectional study used a survey to collect data at the author's Hospital from December 2023 to February 2024. Consecutive adult patients who were referred for diagnostic gastrointestinal endoscopy were enrolled using convenience sampling. To minimize heterogeneity, patients with a confirmed inflammatory bowel disease diagnosis or those undergoing therapeutic procedures were excluded. The research received approval from the Medical Ethics Committee of the author's Hospital, and all the study participants provided informed consent.

Inclusion criteria were the following: 1) those who underwent gastrointestinal endoscopy (gastroscopy or colonoscopy); 2) those who voluntarily participated; 3) those who were conscious and able to cooperate.

Exclusion criteria were the following: 1) those with critical condition; 2) those who underwent gastrointestinal endoscopy for gastrointestinal bleeding; 3) those unable to complete the questionnaire for other reasons.

Questionnaire

The questionnaire was developed through a systematic review of relevant literature and current clinical practice guidelines. Content validity was established through an expert panel review by two gastroenterologists and two endoscopy nurses.[21,22] Following the questionnaire's design, a pilot study was carried out involving 76 participants, generating a Cronbach's α coefficient = 0.912, indicative of good internal consistency. The final questionnaire included 4 dimensions: knowledge, attitude, practice, and demographic characteristics, comprising basic patient demographics, reasons for seeking medical care, daily routines, and dietary habits. The knowledge section consisted of 9 questions, with responses scored assigned 2 points for "complete understanding", 1 point for "partial understanding", and 0 for "lack of understanding", generating a total score of 0 to 18. The attitude section consisted of 7 questions, rated on a five-point Likert scale from "strongly agree" to "strongly disagree", with scores ranging from 5 points to 1 point and a total score range of 7 to 35. The practice section included 8 items, also rated on a five-point Likert scale from "always" to "never", with values ranging from 5 points to 1 point and a total score of 8 to 40. According to Bloom's cutoff, participants who scored > 80% of the total were classified as possessing satisfactory knowledge, constructive attitudes, and active practices, while those scoring between 60% and 80% were classified as possessing average levels in these dimensions. Scoring < 60% of the total suggested inadequate knowledge, negative attitudes, and passive behaviors.[23]

The questionnaire was generated using the "Questionnaire Star" platform, after which a QR code was obtained, printed, and placed in the endoscopy room. After patients completed their endoscopy and fully regained consciousness, two specially trained nurses invited them to the endoscopy room to scan the QR code and complete the questionnaire. Patients scanned the QR code and completed the questionnaire using their phone, with each phone allowing only one submission of responses. Researchers will only provide clarifications about the questions without offering any hints for the answers. For elderly patients who cannot use a mobile phone, the nurses will record the patients' answers and fill out the questionnaire on their behalf.

To further evaluate the validity of the questionnaire, both content validity and construct validity were assessed. Content validity was established through expert review by two gastroenterologists and two endoscopy nurses. Construct validity was examined using confirmatory factor analysis (CFA) (Supplementary Table 1). The Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.913 ($P < 0.001$), indicating sampling adequacy. Model fit indices demonstrated good construct validity (CMIN/DF = 4.487; RMSEA = 0.076; IFI = 0.937; TLI = 0.929; CFI = 0.937), and all standardized factor loadings were statistically significant ($P < 0.001$). A CFA path diagram is presented in Supplementary Figure 1 to illustrate the measurement structure.

Statistical Analysis

Statistical analysis was conducted using SPSS 22.0 (IBM, Armonk, NY, USA). Continuous data are reported as mean ± standard deviation (SD), and categorical data are expressed as n (%). Continuous data that were confirmed to follow a normal distribution were analyzed using independent-sample t-tests or one-way ANOVA. The Wilcoxon Mann–Whitney test or Kruskal–Wallis test was used to compare continuous data with skewed distribution. The correlation among KAP was analyzed using Pearson correlation analysis, and interactions among KAP were explored using structural equation modeling (SEM) performed with AMOS version 26.0. A two-sided P-value less than 0.05 was considered statistically significant.

Results

Patients' Characteristics

Among a total of 744 collected questionnaires, 20 refused to participate in the study, 9 had a short response time (< 90 seconds), 13 had a logical conflict, and 80 were incomplete, resulting in 612 valid questionnaires, with a validity rate of 82.26%.

Out of these 612 participants, 308 (50.33%) were filled out by males; the mean age of participants was 51.11 ± 12.61 years; 363 (62.42%) had a BMI in the normal range; 152 (24.84%) had poor dietary habits, 250 (40.85%) had heavy taste preference in their diets and 147 (24.02%) were frequently constipated. Meanwhile, 355 (58.01%) had their first gastroscopy, 561 (91.67%) opted for a painless procedure, and 308 (50.33%) had gastrointestinal polyps (Table 1).

Table 1 Demographic Characteristics, Knowledge, Attitude, and Practice

	N (%)	Knowledge	P	Attitude	P	Practice	P
N=612							
Total		11.66±3.95		29.79±3.27		36.69±4.99	
Gender			0.198		0.647		0.692
Male	308 (50.33)	11.94±4.04		29.84±3.24		36.64±5.15	
Female	304 (49.67)	11.38±3.84		29.73±3.31		36.74±4.82	
Age, years	51.11±12.61						
BMI			0.681		0.071		0.061
Light (< 18.5 kg/m^2)	19 (3.10)	11.11±4.20		29.63±2.81		36.21±4.06	
Normal (18.5–24.9 kg/m^2)	363 (62.42)	11.56±3.88		30.04±3.30		37.10±4.71	
Overweight or obese (≥25 kg/m^2)	230 (37.58)	11.87±4.03		29.40±3.24		36.07±5.41	
Education			<0.001		0.714		0.020
Middle school and below	200 (32.68)	10.79±3.66		29.71±3.03		36.34±5.06	
High school and Technical secondary school	115 (18.79)	11.65±3.72		29.70±3.13		36.52±5.09	
Junior college	73 (11.93)	11.99±4.27		29.58±3.81		36.29±5.04	
Undergraduate	197 (32.19)	12.19±4.04		29.95±3.34		37.09±4.89	
Postgraduate and above	27 (4.41)	13.44±4.23		30.04±3.67		38.19±4.42	
Monthly income, CNY			0.010		0.241		<0.001
<2000	77 (12.58)	10.99±4.17		29.69±3.01		35.29±5.98	
2000–5000	137 (22.39)	10.83±3.80		29.48±3.28		35.66±5.44	
5000–10,000	213 (34.80)	12.15±3.85		29.66±3.51		36.65±5.00	
10,000–20,000	159 (25.98)	11.87±3.91		30.14±3.10		38.08±3.75	
>20,000	26 (4.25)	12.73±4.30		30.54±2.83		38.12±3.20	
Smoking			0.399		0.096		0.774
Yes	118 (19.28)	11.98±4.22		29.21±3.75		36.36±5.82	
No	494 (80.72)	11.59±3.88		29.92±3.14		36.77±4.77	
Drinking			0.047		0.293		0.263
Once every 1–2 days	45 (7.35)	12.42±4.56		28.71±3.49		35.96±5.58	
Once every 3–7 days	45 (7.35)	12.36±3.94		29.60±3.58		35.27±5.77	
Once every 8–15 days	39 (6.37)	11.59±4.30		29.79±3.58		36.90±5.35	
Once every 16–30 days	25 (4.08)	12.52±4.48		30.24±3.21		36.48±4.19	
Once a month or less	71 (11.60)	12.61±3.96		30.24±3.32		36.82±5.30	
Do not drink	387 (63.24)	11.27±3.76		29.82±3.16		36.91±4.76	
Poor dietary habits			0.772		0.064		0.406
Yes	152 (24.84)	11.70±4.00		29.37±3.50		36.91±5.05	
No	460 (75.16)	11.65±3.94		29.92±3.19		36.62±4.97	
Heavy taste preference			0.384		0.501		0.412
Yes	250 (40.85)	11.52±3.95		29.62±3.47		36.59±5.59	
No	362 (59.15)	11.76±3.95		29.90±3.13		36.76±4.53	
Frequently consume overnight meals			0.105		0.310		0.555
Yes	155 (25.33)	11.27±4.10		29.57±3.42		36.58±5.11	
No	457 (74.67)	11.79±3.89		29.86±3.22		36.73±4.95	

(*Continued*)

Table 1 (Continued).

	N (%)	Knowledge	P	Attitude	P	Practice	P
Family history of stomach or colon cancer			0.008		0.765		0.389
Yes	88 (14.38)	12.66±4.47		29.82±3.76		36.97±4.84	
No	524 (85.62)	11.49±3.83		29.78±3.19		36.64±5.01	
Frequently constipated			0.999		0.295		0.525
Yes	147 (24.02)	11.64±3.87		30.16±3.20		36.78±4.79	
No	465 (75.98)	11.67±3.98		29.67±3.29		36.66±5.05	
Frequently experience unexplained changes in bowel habits, or abnormal faeces			0.002		0.049		0.425
Yes	84 (13.73)	12.81±3.84		30.46±3.24		37.44±3.74	
No	528 (86.27)	11.48±3.94		29.68±3.27		36.57±5.15	
Number of gastroscopies performed			<0.001		0.047		0.015
First time	355 (58.01)	10.88±3.66		29.54±3.35		36.50±5.24	
Second time	146 (23.86)	11.75±3.74		29.86±3.18		36.15±5.26	
Third time and above	111 (18.13)	14.05±4.16		30.49±3.06		38.02±3.31	
Type of your current gastroenteroscopy			0.747		0.180		<0.001
General gastroscopy and/or general enteroscopy	51 (8.33)	11.76±3.90		29.12±3.85		33.37±6.89	
Painless gastroscopy and/or painless enteroscopy	561 (91.67)	11.65±3.96		29.85±3.21		36.99±4.67	
Gastrointestinal polyps			0.273		0.015		0.864
Yes	308 (50.33)	11.87±3.99		30.11±3.20		36.88±4.60	
No	304 (49.67)	11.45±3.90		29.45±3.32		36.49±5.35	
Number of polyps			0.015		0.090		0.607
1	91 (14.87)	12.66±4.01		30.10±3.55		36.27±5.06	
2	149 (24.35)	11.19±3.68		30.01±3.02		37.28±4.08	
3 and above	68 (11.11)	12.32±4.39		30.35±3.13		36.82±4.99	
Whether your polyp is larger than 5 mm			0.445		0.030		0.618
Yes	75 (12.25)	11.56±3.99		29.75±3.09		36.52±4.72	
No	233 (38.07)	11.97±3.99		30.23±3.23		37.00±4.56	

Among the 308 patients with polyps, the majority (225 cases, 73.1%) underwent painless enteroscopy alone, followed by 33 cases (10.7%) who received both painless enteroscopy and painless gastroscopy, and 29 cases (9.4%) with painless gastroscopy alone. This distribution, as visualized in the UpSet plot (Figure 1), indicates that painless colonoscopy was the predominant modality associated with polyp detection in this study. The reason for the endoscopy examination and results are shown in Figure 2. "Life stage screening" refers to routine health check-ups commonly recommended based on age or risk factors, such as colorectal cancer screening in adults over 50.

Knowledge, Attitude, and Practice

The mean scores for knowledge, attitude, and practice were 11.66 ± 3.95 (possible range: 0–18), 29.79 ± 3.27 (possible range: 7–35), and 36.69 ± 4.99 (possible range: 8–40), separately. Knowledge scores varied depending on education ($P < 0.001$), monthly income ($P = 0.010$), alcohol consumption ($P = 0.047$), family history of gastric or colorectal cancer (immediate family) ($P = 0.008$), unexplained changes in bowel habits or fecal abnormalities ($P = 0.002$), number of gastroscopies ($P < 0.001$), and the number of polyps ($P = 0.015$). Attitude scores were more likely to vary depending on unexplained changes in bowel habits or fecal abnormalities ($P = 0.049$), number of gastroscopies ($P = 0.047$), presence of polyps ($P = 0.015$), and whether the polyp was >5 mm ($P = 0.030$). Practice scores varied depending on education ($P = 0.020$), monthly income ($P < 0.010$), number of gastroscopies ($P = 0.015$), and type of the current gastroenteroscopy ($P < 0.001$) (Table 1).

For all the knowledge items, no more than 40% of the participants answered "Very well known", while more than 60% chose "Heard of it", indicating that while progress has been made, there remains ample opportunity for further improvement. Specifically, for " Endoscopic examinations can assess different areas of the gastrointestinal tract, such as the esophagus, stomach, duodenum, and colon.", 70.1% chose "Heard of it" (K3). As for "This examination is typically

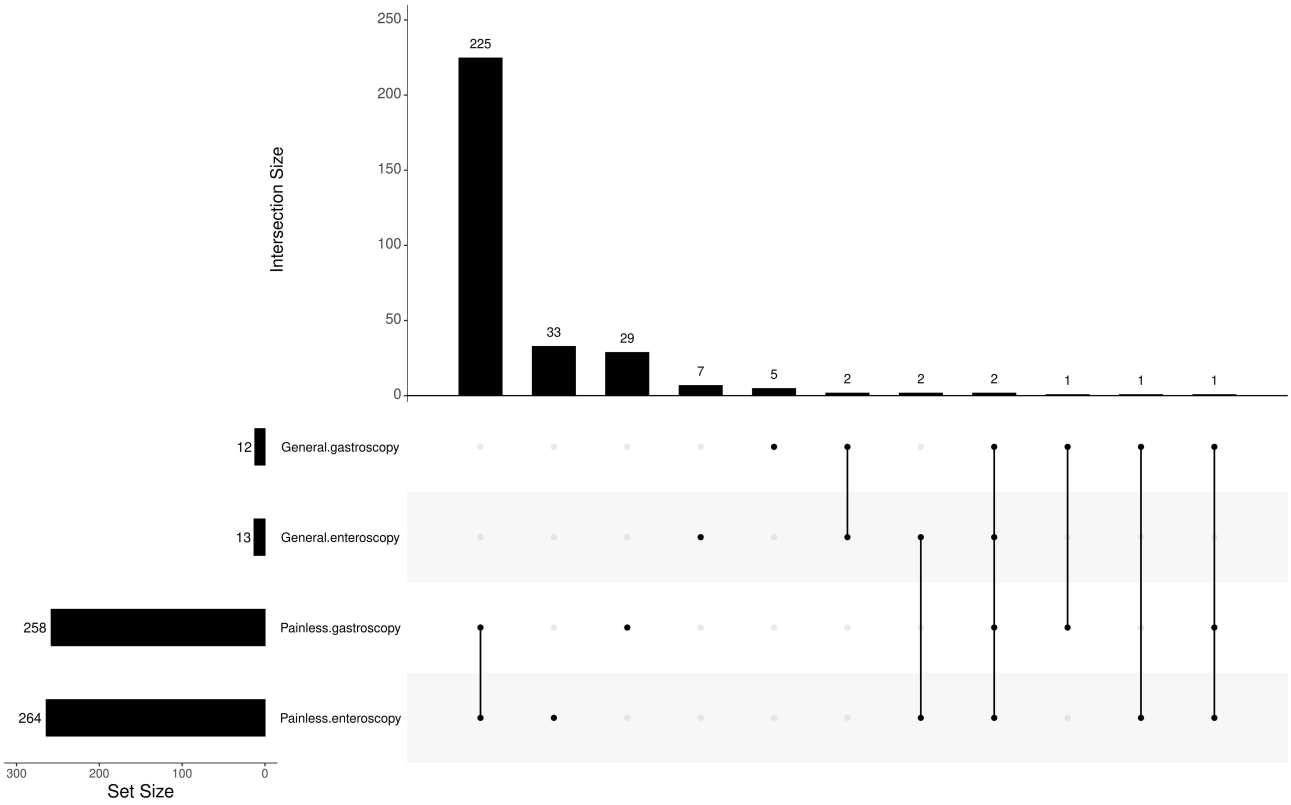

Figure 1 UpSet plot showing the distribution of gastrointestinal endoscopic procedures among the 308 patients diagnosed with polyps.

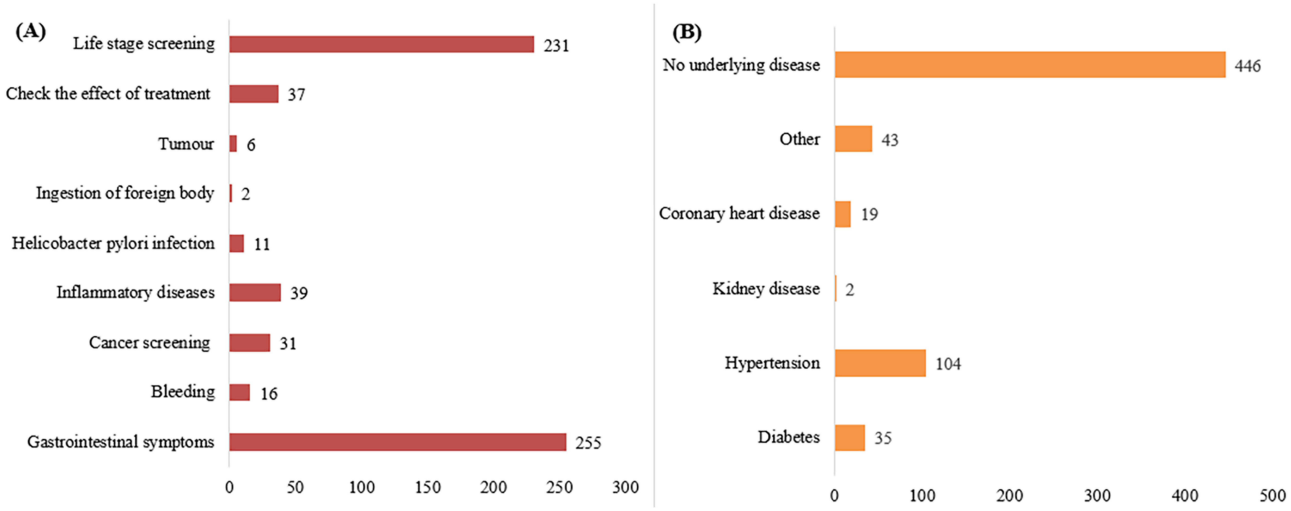

Figure 2 (A) Reasons for undergoing digestive endoscopy (including upper and lower GI procedures); "Life stage screening" refers to routine health check-ups. (**B**) Results of endoscopic examinations.

used to diagnose gastrointestinal diseases such as ulcers, tumors, and inflammation.", 69.77% chose "Heard of it" (K2) (Table 2).

For the attitude dimension, more than 90% of participants chose either "strongly agree" or "agree", except for A1 and A3. Specifically, 23.37% and 23.53% were neutral on whether they felt nervous or anxious before the examination (A1) and whether they were worried about the safety and side effects of endoscopy (A3), respectively (Table 3).

Table 2 Responses to the Knowledge Section

	N (%)		
	Very Well Known	**Heard of it**	**Do Not Know**
1. Gastrointestinal endoscopy entails the insertion of a flexible tubular instrument to visualize the interior of the gastrointestinal tract during a medical examination.	168 (27.45)	426 (69.61)	18 (2.94)
2. This examination is typically used to diagnose gastrointestinal diseases such as ulcers, tumors, and inflammation.	165 (26.96)	427 (69.77)	20 (3.27)
3. Endoscopic examinations encompass the evaluation of diverse gastrointestinal tract segments, including the esophagus, stomach, duodenum, and colon.	157 (25.65)	429 (70.1)	26 (4.25)
4. To ensure the precision of the examination, patients typically undergo a fasting period of no less than 6 hours before the procedure.	229 (37.42)	377 (61.6)	6 (0.98)
5. Anesthesia or sedatives may be used during the examination to alleviate patient discomfort.	220 (35.95)	385 (62.91)	7 (1.14)
6. Endoscopic examinations generally exhibit a brief duration, but the specific length depends on the scope of the examination and the information needed.	194 (31.7)	401 (65.52)	17 (2.78)
7. Patients may experience some discomfort during the examination, which is usually temporary.	200 (32.68)	402 (65.69)	10 (1.63)
8. One of the primary objectives of endoscopic examination is the prompt detection of early-stage tumors or other abnormalities.	214 (34.97)	388 (63.4)	10 (1.63)
9. The timing and frequency of gastroscopy necessitate individualized determination based on specific circumstances, highlighting the recommendation for examinations to be conducted under the guidance of a medical professional. This approach ensures timely detection and prevention of potential gastrointestinal problems.	208 (33.99)	392 (64.05)	12 (1.96)

Table 3 Responses to the Attitude Section

	N (%)				
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
1. Before the examination, I feel nervousness or anxiety.	130 (21.24)	307 (50.16)	143 (23.37)	22 (3.59)	10 (1.63)
2. I firmly believe that gastrointestinal endoscopy plays a crucial role in the timely detection of potential problems in the gastrointestinal tract.	244 (39.87)	343 (56.05)	24 (3.92)	1 (0.16)	/
3. I am concerned about endoscopic examination's safety and side effects.	144 (23.53)	286 (46.73)	144 (23.53)	31 (5.07)	7 (1.14)
4. During the examination, I felt that the doctors and medical staff were very caring and professional towards me.	305 (49.84)	279 (45.59)	27 (4.41)	1 (0.16)	/
5. I believe that gastrointestinal endoscopy is very beneficial for my personal health.	304 (49.67)	275 (44.93)	29 (4.74)	4 (0.65)	/
6. I perceive gastrointestinal endoscopy as a relatively safe examination method for patients.	297 (48.53)	278 (45.42)	36 (5.88)	1 (0.16)	/
7.If necessary, I would be willing to undergo gastrointestinal endoscopy again.	282 (46.08)	291 (47.55)	39 (6.37)	/	/

Responses on the practice revealed that > 70% of the participants chose "always" for all items except P2 and P3. Specifically, 68.63% of the participants were always fully aware of the endoscopy procedure and possible discomfort before the examination (P2), and 61.44% of the participants always raised concerns and questions about the procedure with the doctor prior to the examination (P3) (Table 4).

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Table 4 Responses to the Practice Section

	N (%)				
	Always	**Often**	**Sometimes**	**Occasionally**	**Never**
1. I adhered to the physician's recommendations and completed the preparatory measures for gastrointestinal endoscopy (such as dietary restrictions, using laxatives, or enemas).	468 (76.47)	95 (15.52)	30 (4.9)	11 (1.8)	8 (1.31)
2. Before the examination, I fully understood the process of endoscopic examination and the possible discomfort.	420 (68.63)	113 (18.46)	56 (9.15)	18 (2.94)	5 (0.82)
3. Prior to undergoing gastrointestinal endoscopy, I voiced my concerns and posed questions regarding the examination process to the attending physician.	376 (61.44)	115 (18.79)	72 (11.76)	35 (5.72)	14 (2.29)
4. Before the endoscopic examination, I voluntarily informed the doctor about my medication allergies or other relevant information.	433 (70.75)	113 (18.46)	50 (8.17)	9 (1.47)	7 (1.14)
5. After the endoscopic examination, I will adhere to the doctor's advice regarding the intake or adjustment of medications.	458 (74.84)	98 (16.01)	43 (7.03)	9 (1.47)	4 (0.65)
6. After the examination, I will ensure to rest and recuperate adequately as per the doctor's recommendations.	468 (76.47)	99 (16.18)	39 (6.37)	4 (0.65)	2 (0.33)
7. After the examination, I will follow the doctor's advice on diet and exercise.	472 (77.12)	97 (15.85)	38 (6.21)	5 (0.82)	/
8.I will arrange follow-up appointments or regular check-ups subsequent to the examination, engaging in discussions with the doctor regarding the examination results and devising a plan for any necessary further treatment.	461 (75.33)	104 (16.99)	39 (6.37)	7 (1.14)	1 (0.16)

The Correlation and Interaction Among KAP

The correlation analyses revealed statistically significant, weak to moderate positive correlations: knowledge was weakly correlated with attitude ($r = 0.281$, $P < 0.001$) and with practice ($r = 0.148$, $P < 0.001$), while attitude demonstrated a moderate correlation with practice ($r = 0.370$, $P < 0.001$) (Table 5).

The SEM model showed that the questionnaire fit the KAP model well (Figure 3 and Supplementary Table 2), and the analysis of direct and indirect effects showed that knowledge directly affected attitude ($\beta = 0.397$, $P = 0.026$) and attitude directly affected practice ($\beta = 0.402$, $P = 0.007$). Although the direct effect of knowledge on practice is not significant ($\beta = 0.032$, $P = 0.568$), knowledge has an indirect effect on practice through attitude ($\beta = 0.159$, $P = 0.014$) (Table 6).

Table 5 Correlation Analysis

	Knowledge	**Attitude**	**Practice**
Knowledge	1		
Attitude	0.281 (P<0.001)	1	
Practice	0.148 (P<0.001)	0.370 (P<0.001)	1

Note: Correlation strength interpretation: 0.00–0.19 "very weak"; 0.20–0.39 "weak"; 0.40–0.59 "moderate"; 0.60–0.79 "strong"; 0.80–1.0 "very strong".

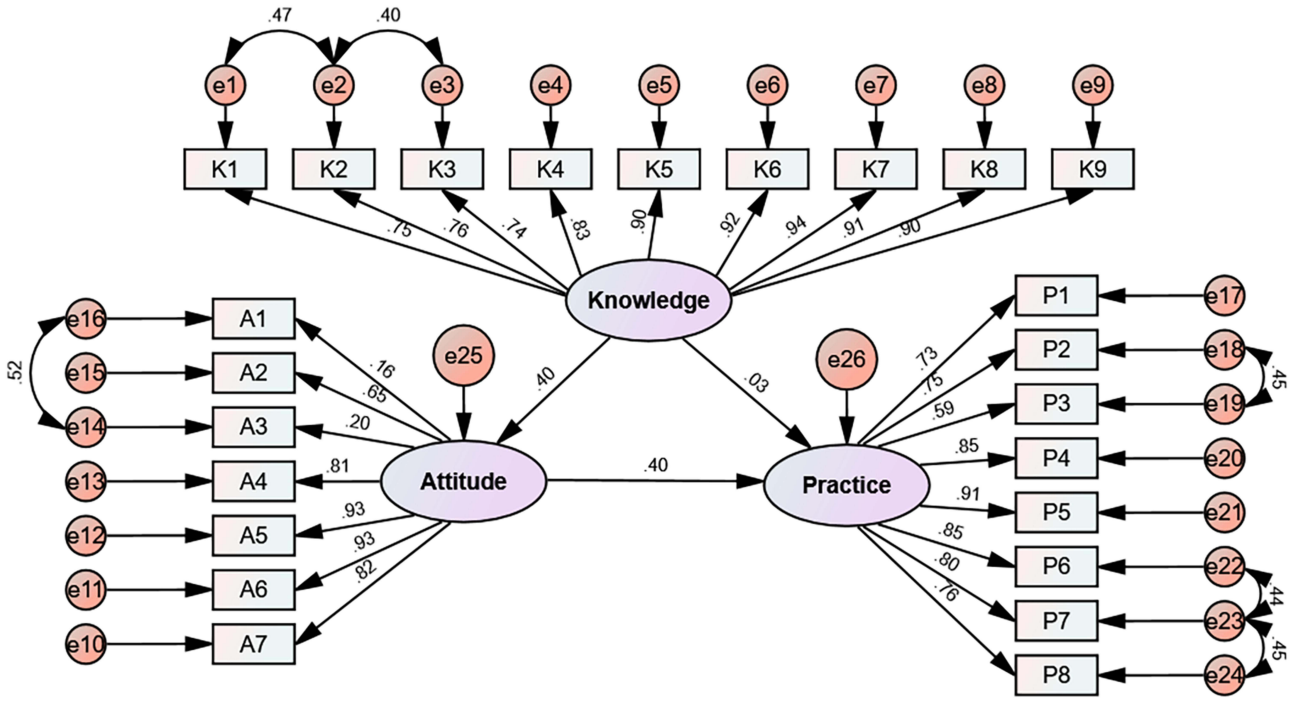

Figure 3 Structural Equation Model.

Discussion

Our findings reveal important knowledge gaps among patients undergoing diagnostic endoscopy, despite their generally positive attitudes and adherence to recommended practices. Notably, over 60% of participants reported only partially understanding basic endoscopic concepts, highlighting a critical need for enhanced pre-procedure education. Healthcare providers in the Endoscopy Unit should prioritize patient education to enhance their understanding of gastrointestinal endoscopy, ultimately improving their overall experience and outcomes.

This study investigates the KAP of patients undergoing gastrointestinal endoscopy, unveiling a paradoxical scenario in which patients display inadequate knowledge yet exhibit positive attitudes and proactive practices towards the procedure. Previous studies have explored patient involvement in gastrointestinal endoscopy from the patients' viewpoints, revealing that patient participation typically varied from minimal to basic levels, it occasionally reached higher levels when staff actively involved patients in decision-making processes.[24] These findings underscore the significant responsibility of endoscopy staff to recognize individual patient needs and enhance patient engagement. The results of the current study resonate with these observations, suggesting a consistent pattern across different settings.

Significant disparities in KAP scores were noted across demographic and clinical variables. Notably, education level emerged as a pivotal factor, aligning with existing literature suggesting a positive association between higher education and health literacy.[25,26] Individuals with higher levels of education typically exhibited better knowledge and practice

Table 6 Direct and Indirect Effects in SEM

Model Paths	Standardized Total Effects		Standardized Direct Effects		Standardized Indirect Effects	
	β (95% CI)	P	β (95% CI)	P	β (95% CI)	P
K→A	0.397 (0.277–0.469)	**0.026**	0.397 (0.277–0.469)	**0.026**		
K→P	0.192 (0.079–0.257)	**0.026**	0.032 (−0.063–0.106)	0.568	0.159 (0.105–0.204)	**0.014**
A→P	0.402 (0.299–0.500)	**0.007**	0.402 (0.299–0.500)	**0.007**		

Note: Total effects include both direct and indirect effects. A direct effect refers to the direct influence of one variable on another, while an indirect effect indicates the influence mediated through a third variable (eg, knowledge → attitude → practice). Bold values indicate statistical significance (P < 0.05).

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scores, highlighting the essential part that education has in enhancing patient understanding and involvement in medical procedures. This highlights the necessity for focused educational initiatives designed for different backgrounds to effectively bridge knowledge gaps. Similarly, income level emerged as a significant determinant of KAP, corroborating prior research linking socioeconomic status with health outcomes.[27,28] Higher-income groups exhibited better knowledge and practices, possibly because of enhanced access to healthcare resources and information dissemination channels. This highlights the significance of addressing socioeconomic disparities in healthcare delivery and designing interventions that are accessible and affordable for socioeconomically disadvantaged groups.

Patients with a family member diagnosed with stomach or colon cancer exhibited higher knowledge scores, likely due to several interconnected factors. Familial experiences of cancer diagnosis and treatment may have heightened awareness and understanding of gastrointestinal health conditions among these individuals. Additionally, the perceived susceptibility to similar health issues within the family may have motivated proactive information-seeking behaviors. Open communication patterns within families about health concerns, including genetic predispositions and disease experiences, likely facilitated the exchange of knowledge and support, contributing to greater awareness among patients. Moreover, the familial context may have increased exposure to healthcare services and screening programs, encouraging individuals to actively engage in preventive healthcare practices.[29,30] Additionally, the positive relationship between the number of gastroscopies a patient underwent and KAP scores highlights how previous experiences influence patient engagement and empowerment. Patients undergoing repeated procedures demonstrated superior knowledge and practices, possibly attributed to familiarity with the process and ongoing education through healthcare interactions.[31] This highlights the importance of continuity of care and patient-provider communication in fostering health literacy and promoting proactive healthcare behaviors over time.

In the correlation analyses and SEM, the interaction among knowledge, attitudes, and practices was elucidated, revealing a pathway through which knowledge influences attitude, which in turn impacts practice. Although the direct impact of knowledge on practice was not significant, the indirect effect mediated by attitude highlights the crucial influence of patient perceptions and beliefs in shaping health-related behaviors. This underscores the importance of addressing not only factual knowledge but also attitudinal barriers in promoting behavior change and adherence to medical recommendations.[32]

The results from the knowledge section reveal a substantial awareness of gastrointestinal endoscopy but also highlight specific gaps in understanding. Remarkably, the highest familiarity is with the requirement for patients to fast before the examination, which reflects a basic understanding that might stem from general pre-procedure instructions given in various medical contexts. Conversely, the concept of endoscopic examinations covering various parts of the gastrointestinal tract was among the least recognized. This could indicate a lack of detailed communication about the procedure's scope, which is often not elaborated on unless directly relevant to the patient's condition. Recommendations to improve patient knowledge could include providing comprehensive pre-procedural education materials covering all aspects of the endoscopic process, including detailed instructions on preparatory measures and post-examination care. Interactive educational sessions led by healthcare providers could also address patient queries and concerns in real-time, enhancing understanding and adherence to pre-procedural instructions.[15,33]

The attitudes section illustrates a strong recognition of the importance of gastrointestinal endoscopy in detecting potential health issues, with significant agreement observed. This positive attitude is pivotal for patient compliance and procedural success. However, the results also show a notable percentage of respondents feeling nervous or anxious before the examination. This anxiety can adversely affect the preparation and cooperation needed during the procedure. To address these concerns, healthcare providers could implement pre-procedural counseling sessions focusing on anxiety management techniques and addressing patient-specific fears. Creating a supportive and reassuring environment during the examination through clear communication and empathetic care practices can also alleviate patient anxiety and enhance overall satisfaction with the procedure.[33]

In the practice section, adherence to pre-examination preparations like dietary restrictions is notably high, indicating effective communication of these requirements. However, the least compliance was observed in discussing personal concerns and questions about the examination with doctors, which could hinder personalized care and lead to increased anxiety. These findings highlight the crucial need to enhance patient education and enable individuals to actively

participate in their healthcare journey. Implementing personalized care plans and follow-up protocols tailored to individual patient needs can promote sustained engagement in recommended practices and enhance long-term health outcomes. Moreover, incorporating technology-based solutions like mobile apps or telehealth platforms can enhance communication between patients and healthcare providers, enabling ongoing support and monitoring outside of the clinical environment.[34,35]

This study has important practical implications for routine clinical practice. Incorporating KAP assessments into standard pre-endoscopy evaluations may help identify patients with limited understanding or elevated anxiety, allowing for targeted educational interventions. Tailored communication strategies, such as illustrated booklets or video-based tools, could be developed to address specific knowledge gaps and improve psychological preparedness. To maximize impact, these efforts should go beyond conveying factual information and also aim to reinforce positive attitudes and encourage proactive health behaviors. Enhancing public awareness of the indications, diagnostic and therapeutic roles of endoscopy—and its value in the early detection of malignancies—may ultimately support more timely diagnoses and improved long-term outcomes in gastrointestinal health. Future research should focus on evaluating the effectiveness of these approaches in improving patient comprehension, satisfaction, and procedural outcomes.

Several limitations warrant consideration. First, our post-procedure questionnaire timing may have introduced recall bias and potentially overestimated patient knowledge due to pre-procedure education. Second, the heterogeneous study population, including both diagnostic and screening patients, limits the generalizability of our findings to specific patient subgroups. Third, our single-center design and convenience sampling method may not fully represent the broader patient population. Finally, self-reported data collection could introduce social desirability bias. Furthermore, the cross-sectional design of the study prevents the establishment of causality and temporal relationships between variables. Notwithstanding these limitations, the strengths of this paper are found in its thorough evaluation of knowledge, attitudes, and practices regarding gastrointestinal endoscopy among patients, as well as its utilization of both correlation and structural equation modeling analyses to explore the relationships between these variables, providing valuable insights for enhancing patient care and education within Endoscopy Units. In addition, while we analyzed the relationship between KAP and the number of gastroscopies, we did not assess colonoscopy frequency separately. Considering the high proportion of patients with polyps, this may have limited our ability to fully explore associations related to lower gastrointestinal endoscopy. Additionally, indications and findings for upper and lower gastrointestinal endoscopies were not collected separately. This may have limited the interpretability of certain result distributions.

Conclusion

To conclude, patients in the Endoscopy Unit demonstrated limited knowledge, favorable attitudes, and proactive practices regarding gastrointestinal endoscopy. Specifically, knowledge gaps were most prominent in understanding the scope of endoscopic examination-including the anatomical regions visualized (eg, esophagus, stomach, duodenum, and colon) and its diagnostic capabilities for conditions such as ulcers, tumors, and inflammation. These findings highlight the need for targeted educational interventions that address these fundamental concepts to enhance patient comprehension, informed consent, and overall procedural cooperation, thereby improving clinical outcomes and satisfaction.

Data Sharing Statement

All data generated or analysed during this study are included in this published article.

Ethics Approval and Consent to Participate

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The study was approved by the Medical Ethics Committee of Dongying People's Hospital (DYYX-2023-182) All participants provided written informed consent prior to enrollment. For elderly participants requiring assistance with questionnaire completion, trained research nurses provided support while ensuring participant privacy and autonomy. The study was carried out in accordance with the applicable guidelines and regulations.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

Lianmin Wei and Qing Niu are co-first authors for this study. The authors report no other conflicts of interest in this work.

References

1. Wen Z, Li X, Lu Q, et al. Health related quality of life in patients with chronic gastritis and peptic ulcer and factors with impact: a longitudinal study. *BMC Gastroenterol*. 2014;14(1):149. doi:10.1186/1471-230X-14-149
2. Sipponen P, Maaroos HI. Chronic gastritis. *Scand J Gastroenterol*. 2015;50(6):657–667. doi:10.3109/00365521.2015.1019918
3. Kuna L, Jakab J, Smolic R, et al. Peptic ulcer disease: a brief review of conventional therapy and herbal treatment options. *J Clin Med*. 2019;8 (2):179. doi:10.3390/jcm8020179
4. Lanas A, Chan FKL. Peptic ulcer disease. *Lancet*. 2017;390(10094):613–624. doi:10.1016/S0140-6736(16)32404-7
5. Burisch J, Jess T, Martinato M, et al. The burden of inflammatory bowel disease in Europe. *J Crohns Colitis*. 2013;7(4):322–337. doi:10.1016/j.crohns.2013.01.010
6. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. *CA Cancer J Clin*. 2020;70(1):7–30. doi:10.3322/caac.21590
7. Triantafillidis JK, Merikas E, Nikolakis D, et al. Sedation in gastrointestinal endoscopy: current issues. *World J Gastroenterol*. 2013;19(4):463–481. doi:10.3748/wjg.v19.i4.463
8. Liu T, Deng H, Yu X, et al. Compilation and evaluation of gastrointestinal endoscopy satisfaction scale. *Zhong Nan Da Xue Xue Bao Yi Xue Ban*. 2023;48(6):859–867. doi:10.11817/j.issn.1672-7347.2023.220615
9. Yang C, Sriranjan V, Abou-Setta AM, et al. Anxiety associated with colonoscopy and flexible sigmoidoscopy: a systematic review. *Am J Gastroenterol*. 2018;113(12):1810–1818. doi:10.1038/s41395-018-0398-8
10. Loftus R, Nugent Z, Graff LA, et al. Patient satisfaction with the endoscopy experience and willingness to return in a central Canadian health region. *Can J Gastroenterol*. 2013;27(5):259–266. doi:10.1155/2013/615206
11. Pourshams A, Sepanlou SG, Ikuta KS. The global, regional, and national burden of pancreatic cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the global burden of disease study 2017. *Lancet Gastroenterol Hepatol*. 2019;4 (12):934–947. doi:10.1016/S2468-1253(19)30347-4
12. Alatab S, Sepanlou SG, Ikuta K. The global, regional, and national burden of inflammatory bowel disease in 195 countries and territories, 1990-2017: a systematic analysis for the global burden of disease study 2017. *Lancet Gastroenterol Hepatol*. 2020;5(1):17–30. doi:10.1016/S2468-1253(19)30333-4
13. Koni A, Taha S, Daifallah A, et al. A cross-sectional evaluation of knowledge, attitudes, practices, and perceived challenges among Palestinian pharmacists regarding COVID-19. *SAGE Open Med*. 2022;10:20503121211069278. doi:10.1177/20503121211069278
14. Shubayr MA, Kruger E, Tennant M. Oral health providers' views of oral health promotion in Jazan, Saudi Arabia: a qualitative study. *BMC Health Serv Res*. 2023;23(1):214. doi:10.1186/s12913-023-09170-8
15. Berry P, Kotha S, Tritto G, et al. A three-tiered approach to investigating patient safety incidents in endoscopy: 4-year experience in a teaching hospital. *Endosc Int Open*. 2021;9(8):E1188–e1195. doi:10.1055/a-1479-2556
16. Bazerbachi F, Chahal P, Shaukat A. Improving upper gastrointestinal endoscopy quality. *Clin Gastroenterol Hepatol*. 2023;21(10):2457–2461. doi:10.1016/j.cgh.2023.04.002
17. Libânio D, Pimentel-Nunes P, Bastiaansen B, et al. Endoscopic submucosal dissection techniques and technology: European society of gastrointestinal endoscopy (ESGE. *Technical Rev Endoscopy*. 2023;55(4):361–389. doi:10.1055/a-2031-0874
18. Nassani N, Alsheikh M, Carroll B, et al. Theranostic gastrointestinal endoscopy: bringing healing light to the lumen. *Clin Transl Gastroenterol*. 2020;11(3):e00119. doi:10.14309/ctg.0000000000000119
19. Minciullo A, Filomeno L. Assessment of patient satisfaction in digestive endoscopy: a narrative review of the literature. *Gastroenterol Nurs*. 2022;45(1):43–51. doi:10.1097/SGA.0000000000000605
20. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med*. 2013;35(2):121–126. doi:10.4103/0253-7176.116232
21. Kuzhively J, Pandit JJ. Anesthesia and airway management for gastrointestinal endoscopic procedures outside the operating room. *Curr Opin Anaesthesiol*. 2019;32(4):517–522. doi:10.1097/ACO.0000000000000745
22. Sidhu R, Turnbull D, Haboubi H, et al. British society of gastroenterology guidelines on sedation in gastrointestinal endoscopy. *Gut*. 2024;73 (2):219–245. doi:10.1136/gutjnl-2023-330396
23. Bloom BS. Learning for mastery. instruction and curriculum. regional education laboratory for the Carolinas and Virginia, topical papers and reprints Number 1. *Eval Comment*. 1968;1(2):n2.
24. Dubois H, Creutzfeldt J, Törnqvist M, et al. Patient participation in gastrointestinal endoscopy - from patients' perspectives. *Health Expect*. 2020;23 (4):893–903. doi:10.1111/hex.13066
25. Abheiden H, Teut M, Berghöfer A. Predictors of the use and approval of CAM: results from the German general social survey (ALLBUS). *BMC Complement Med Ther*. 2020;20(1):183. doi:10.1186/s12906-020-02966-9

26. Irigoyen-Camacho ME, Velazquez-Alva MC, Zepeda-Zepeda MA, et al. Effect of income level and perception of susceptibility and severity of COVID-19 on stay-at-home preventive behavior in a group of older adults in Mexico City. *Int J Environ Res Public Health*. 2020;17(20):7418. doi:10.3390/ijerph17207418
27. Atri SB, Sahebihagh M, Jafarabadi M, et al. The relationship between health literacy and stages of change in smoking behavior among employees of educational health centers of tabriz university of medical sciences (2016). *Int J Prev Med*. 2018;9(1):91. doi:10.4103/ijpvm.IJPVM_259_17
28. Mularczyk-Tomczewska P, Zarnowski A, Gujski M, et al. Barriers to accessing health services during the COVID-19 pandemic in Poland: a nationwide cross-sectional survey among 109,928 adults in Poland. *Front Public Health*. 2022;10:986996. doi:10.3389/fpubh.2022.986996
29. Bai Y, Cho Lee W, Li G, et al. Development and feasibility of an evidence-based and theory-driven tailored mHealth communication intervention to increase colonoscopy screening rate in first-degree relatives of people with colorectal cancer. *Eur J Oncol Nurs*. 2022;56:102063. doi:10.1016/j.ejon.2021.102063
30. Bisschops R, Rutter MD, Areia M, et al. Overcoming the barriers to dissemination and implementation of quality measures for gastrointestinal endoscopy: European society of gastrointestinal endoscopy (ESGE) and United European gastroenterology (UEG) position statement. *United Europ Gastroenterol J*. 2021;9(1):120–126. doi:10.1177/2050640620981366
31. Sato S, Shiozawa M, Uchiyama M, et al. Correlation between endoscopic features of the anastomosis after low anterior resection and postsurgical anorectal function. *J Gastrointest Oncol*. 2019;10(2):188–193. doi:10.21037/jgo.2018.11.09
32. Hashemiparast M, Sharma M, Asghari Jafarabadi M, et al. Still careless: findings from a cross-sectional study of young pedestrians' risky road crossing behaviors. *Arch Public Health*. 2020;78(1):44. doi:10.1186/s13690-020-00421-2
33. Broder E, Davies A, Alrubaiy L. Using information videos to improve patient satisfaction in endoscopy: a prospective service improvement project. *Cureus*. 2022;14(4):e24108. doi:10.7759/cureus.24108
34. Kutyla MJ, Gray MA, von Hippel C, et al. Improving the quality of bowel preparation: rewarding patients for success or intensive patient education? *Dig Dis*. 2021;39(2):113–118. doi:10.1159/000510461
35. Walter B, Klare P, Strehle K, et al. Improving the quality and acceptance of colonoscopy preparation by reinforced patient education with short message service: results from a randomized, multicenter study (PERICLES-II). *Gastrointest Endosc*. 2019;89(3):506–13.e4. doi:10.1016/j.gie.2018.08.014