DawnMed
JOURNAL

ORIGINAL RESEARCH

Assessment of Knowledge Toward Bowel Ischemia Among the General Population in Al-Ahsa, Saudi Arabia

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Received: September 14, 2026
Reviewed: October 20, 2026
Accepted: October 23, 2026
Published: November 1, 2026

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Cite this article as:

Alsubaie HM, Saleh SM, Bokhamseen FS, Alkhalifah WM, Alabdullah AAS, Abuali AM, et al. Assessment of Knowledge Toward Bowel Ischemia Among the General Population in Al-Ahsa, Saudi Arabia. DawnMed Journal 2(4):75–80 https://doi.org/10.64039/djms.2026.2412

Abstract

Introduction: Bowel ischemia is a time-sensitive vascular emergency that can cause intestinal necrosis and death when diagnosis and treatment are delayed. Public understanding of this condition in Saudi Arabia remains poorly characterized. This study assessed awareness and knowledge of bowel ischemia among adults in Al-Ahsa and identified factors associated with knowledge.

Methodology: This community-based cross-sectional study included 390 non-healthcare adults residing in Al-Ahsa. Data were collected electronically through an expert-reviewed, pilot-tested, self-administered questionnaire. Ten knowledge items generated a score of 0–10; scores below 6 represented poor knowledge. Multiple linear regression was used to identify associated factors.

Results: Only 43 participants (11.0%) had previously heard of bowel or intestinal ischemia. The mean knowledge score was 3.76 ± 3.56 out of 10, demonstrating poor knowledge. Healthcare professionals were the leading information source among aware participants (32.6%). The best-recognized concepts were the need for urgent assessment of sudden severe unexplained abdominal pain (mean item score = 0.57) and the benefit of early diagnosis and treatment (0.56). The least-recognized concepts were blood in the stool as a possible manifestation (0.25) and the definition of bowel ischemia (0.29). Previous awareness independently predicted a higher knowledge score (B = 4.332, $p < 0.001$); gender, age, and educational level were not significant predictors.

Conclusion: Adults in Al-Ahsa had limited awareness and important knowledge gaps regarding bowel ischemia. Clinician-led education delivered through trusted digital platforms should emphasize its definition, warning manifestations, risk factors, and need for urgent evaluation.

Keywords: Bowel ischemia; Mesenteric ischemia; Public awareness; Health knowledge; Cross-sectional study.

Introduction

Bowel ischemia refers to a group of disorders resulting from inadequate blood flow to the intestines, leading to insufficient oxygen delivery and subsequent intestinal injury [1]. Depending on the affected vascular territory and duration of ischemia, bowel ischemia may present as acute mesenteric ischemia, chronic mesenteric ischemia, or ischemic colitis [2]. Acute mesenteric ischemia is a life-threatening abdominal emergency that requires prompt diagnosis and intervention to prevent irreversible bowel necrosis and death [3–5]. A population-based study reported an incidence of ischemic colitis of approximately 16 cases per 100,000 person-years, with the condition occurring more frequently among older adults and individuals with cardiovascular comorbidities [6]. Ischemic colitis has also been estimated to occur in approximately 1 per 2,000 hospital admissions and appears to be more common among females [7,8]. Globally, acute mesenteric ischemia is considered uncommon; a meta-analysis estimated a mean incidence of 6.2 cases per 100,000 person-years and found that approximately 5 of every 10,000 hospital admissions were due to the condition [9]. Several factors are associated with an increased risk of bowel ischemia, including advanced age, atherosclerotic vascular disease, atrial fibrillation, cardiac disorders, thromboembolic events, hypotension, diabetes mellitus, smoking, and other conditions that impair mesenteric blood flow [1,6,10,11]. Despite the potentially devastating consequences of delayed diagnosis, research evaluating public awareness of bowel ischemia remains limited. A recent study assessing healthcare professionals' knowledge, attitudes, and practices regarding ischemic bowel disease reported adequate knowledge but gaps in attitudes and practice [12]. However, to the best of our knowledge, no published study has evaluated public knowledge, awareness, and attitudes toward bowel ischemia in Al-Ahsa, Saudi Arabia. Therefore, this study aims to assess awareness and knowledge of bowel ischemia among the adult general population residing in Al-Ahsa, Saudi Arabia. It also aims to identify sociodemographic factors associated with knowledge levels and assess public recognition of important symptoms, risk factors, and the need for urgent medical care.

Methodology

Study Design and Setting

A community-based cross-sectional study was conducted among adults residing in Al-Ahsa, Saudi Arabia, from 20 August 2026 to 10 September 2026.

Eligibility Criteria

The study population comprised non-healthcare adults aged 18 years or older who were currently residing in Al-Ahsa, had lived in the region for at least six months, were able to read and understand Arabic or English, and provided electronic informed consent. Individuals were excluded if they were younger than 18 years, did not currently reside in Al-Ahsa, had lived in the region for less than six months, were healthcare professionals, or were students enrolled in healthcare-related programs. Incomplete questionnaires and duplicate responses were also excluded.

Sample Size

The minimum required sample size was calculated using the Raosoft sample size calculator, assuming a 95% confidence level, a 5% margin of error, and a 50% response distribution. The estimated minimum sample size was 385 participants. Additional responses were collected to compensate for incomplete questionnaires, duplicate submissions, and responses that did not meet the eligibility criteria. After applying the eligibility criteria and excluding incomplete or duplicate responses, 390 participants were included in the final analysis.

Data Collection Tool

Data were collected using a structured, self-administered questionnaire developed following a review of the relevant scientific literature. The questionnaire comprised three sections. The first section assessed eligibility, obtained electronic informed consent, and collected sociodemographic information, including place and duration of residence, age, gender, marital status, educational level, and healthcare background.

The second section assessed general awareness by asking whether participants had previously heard of bowel or intestinal ischemia and, if so, their main source of information, including healthcare professionals, internet websites, social media, family or friends, educational institutions, or traditional media. The third section included 10 items assessing knowledge of bowel ischemia. These items addressed its definition, life-threatening nature, high-risk groups, atrial fibrillation as a risk factor, warning manifestations such as sudden severe abdominal pain, blood in the stool, nausea, vomiting, and diarrhea, the risk of intestinal necrosis following delayed treatment, the need for urgent medical assessment, and the benefits of early diagnosis and treatment. The knowledge items emphasized clinically relevant risk factors and warning manifestations rather than relying solely on participants' familiarity with the term "bowel ischemia". Each correct answer was scored 1 and any other response 0, giving a total knowledge score of 0–10; a score below 6 was classified as poor knowledge.

Questionnaire Validation

The questionnaire underwent content and language validation before data collection. First, the English version was reviewed by a panel of three experts, including specialists in general surgery, gastroenterology, and public health. The experts assessed the relevance, clarity, appropriateness, and comprehensiveness of the questionnaire items. The questionnaire was then translated from English into Arabic by a bilingual translator. A pilot study was subsequently conducted among 40 adults from the target population to assess the questionnaire's clarity, comprehensibility, completion time, and technical functionality. Participants in the pilot study were not included in the final study sample. The internal consistency of the knowledge items was evaluated using Cronbach's alpha. The pilot study revealed a Cronbach's alpha coefficient of 0.933 for the Knowledge of Bowel Ischemia scale, indicating excellent internal consistency.

Data Collection Procedure

The questionnaire was created using Google Forms and distributed electronically through social media platforms, including

WhatsApp, X, Telegram, Instagram, and Snapchat. Participants were recruited by convenience sampling.

Statistical Analysis

Data were entered, cleaned, and analyzed using IBM SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequencies and percentages. The individual knowledge-item scores and total knowledge score were summarized using means and standard deviations.

Multiple linear regression analysis was performed to identify factors independently associated with the continuous knowledge score. The variables entered into the regression model included previous awareness of bowel ischemia, gender, age, and educational level. Previous awareness was coded as yes versus no or not sure, and age group and educational level were dummy-coded, with 18–24 years and a bachelor's degree as the reference categories. The assumptions of linear regression were evaluated before interpreting the model. Residuals were assessed for approximate normality using histograms, independence of errors was examined using the Durbin–Watson statistic, multicollinearity was evaluated using variance inflation factor values, and homoscedasticity was assessed using a scatterplot of standardized residuals against standardized predicted values.

The regression results were reported using regression coefficients, t-statistics, and p-values. Model performance was presented using the coefficient of determination (R^2), adjusted R^2, and the F-statistic. Statistical significance was set at $p<0.05$.

Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of King Faisal University on 20 August 2026 (approval no. KFU-REC-2026-AUG-ETHIC-S4362). Before accessing the questionnaire, participants were presented with an electronic information sheet explaining the study objectives, the voluntary nature of participation, confidentiality measures, and their right to withdraw before submitting their responses. Electronic informed consent was obtained from all participants before they proceeded to the questionnaire. No names, identification numbers, telephone numbers, or other direct personal identifiers were collected. All study data were kept confidential, stored securely, and used exclusively for scientific research purposes.

Results

Table 1. Demographic characteristics (N=390)

Characteristics	Categories	N	%
Age	18–24 years	112	28.7
	25–34 years	71	18.2
	35–44 years	64	16.4
	45–54 years	82	21.0
	55 years or older	61	15.6
Gender	Male	158	40.5
	Female	232	59.5
Marital Status	Single	120	30.8
	Married	255	65.4
	Divorced	9	2.3
	Widowed	6	1.5
Educational level	Less than high school	7	1.8
	High school	72	18.5
	Diploma	45	11.5
	Bachelor's degree	249	63.8
	Postgraduate degree	17	4.4

A total of 390 participants currently residing in Al-Ahsa were included. Of these, 112 (28.7%) were aged 18–24 years, 71 (18.2%) were aged 25–34 years, 64 (16.4%) were aged 35–44 years, 82 (21.0%) were aged 45–54 years, and 61 (15.6%) were aged 55 years or older. Of the participants, 232 (59.5%) were female and 158 (40.5%) were male. Most participants were married 255 (65.4%), while 120 (30.8%) were single, 9 (2.3%) were divorced, and 6 (1.5%) were widowed. Regarding educational level, most participants held a bachelor's degree 249 (63.8%), followed by those who had completed high school 72 (18.5%), held a diploma 45 (11.5%), held a postgraduate degree 17 (4.4%), or had less than a high school education 7 (1.8%) (Table 1).

Table 2. General awareness of bowel ischemia (N=390)

Items	Categories	N	%
Have you ever heard of bowel ischemia or intestinal ischemia?	Yes	43	11.0
	No	303	77.7
	Not sure	44	11.3
What has been your main source of information about bowel ischemia? (n=43)	Healthcare professionals	14	32.6
	Internet websites	11	25.6
	Social media	8	18.6
	Family or friends	5	11.6
	Television, newspapers, or other traditional media	2	4.7
	Educational institution	3	7.0

Only 43 participants (11.0%) had previously heard of bowel or intestinal ischemia, whereas 303 (77.7%) had not and 44 (11.3%) were unsure. Among the 43 aware participants, the most common source of information was healthcare professionals 14 (32.6%), followed by internet websites 11 (25.6%), social media 8 (18.6%), family or friends 5 (11.6%), educational institutions 3 (7.0%), and television, newspapers, or other traditional media 2 (4.7%) (Table 2).

Table 3. Knowledge of bowel ischemia by item (N=390)

No	Item	Mean	SD
1	Bowel ischemia occurs when…	0.29	0.45
2	Untreated bowel ischemia can be life-threatening	0.40	0.49
3	Which individual is generally at the greatest risk of developing bowel ischemia	0.38	0.49
4	An irregular heart rhythm, such as atrial fibrillation, may increase the risk of bowel ischemia.	0.31	0.46
5	Sudden, severe abdominal pain that appears greater than the initial physical findings may be a warning sign of bowel ischemia	0.35	0.48
6	Blood in the stool may occur in some patients with bowel ischemia	0.25	0.44
7	Nausea, vomiting, or diarrhea may accompany bowel ischemia	0.32	0.47
8	Delayed treatment of bowel ischemia may result in intestinal tissue death or bowel necrosis	0.33	0.47
9	A person who develops sudden and severe unexplained abdominal pain should seek urgent medical assessment	0.57	0.50
10	Early diagnosis and treatment of bowel ischemia can improve patient outcomes and survival	0.56	0.50
	Total knowledge score (0–10)	**3.76**	**3.56**

Each item was scored 1 for a correct answer and 0 otherwise, so item means equal the proportion of correct answers. SD: standard deviation.

The level of knowledge of bowel ischemia among the general population in Al-Ahsa was poor, with a mean total score of 3.76 ± 3.56 out of 10. The item with the highest mean score was "A person who develops sudden and severe unexplained abdominal pain should seek urgent medical assessment" (mean = 0.57), followed by "Early diagnosis and treatment of bowel ischemia can improve patient outcomes and survival" (mean = 0.56). The item with the lowest mean score was "Blood in the stool may occur in some patients with bowel ischemia" (mean = 0.25), followed by the definition item, "Bowel ischemia occurs when…" (mean = 0.29) (Table 3).

Table 4. Multiple linear regression of factors associated with the knowledge score (N=390)

Predictors	B	t	*p*
Heard of bowel ischemia (yes vs. no/not sure)	4.332	7.893	<0.001
Gender	0.244	0.704	0.482
Age (Reference: 18–24 years)			
25–34 years	0.132	0.26	0.795
35–44 years	0.148	0.278	0.781
45–54 years	−0.047	−0.096	0.924
55 years or older	0.628	1.158	0.248
Education (Reference: Bachelor's degree)			
Less than high school	−1.995	−1.556	0.121
High school	0.022	0.049	0.961
Diploma	−0.79	−1.446	0.149
Postgraduate degree	1.091	1.298	0.195

B: unstandardized regression coefficient. Model: $F(10, 379) = 7.162$, $p<0.001$; $R^2 = 0.159$; adjusted $R^2 = 0.137$.

Multiple linear regression analysis was conducted to identify factors associated with the knowledge score. Assessment of the regression assumptions showed that the residuals were approximately normally distributed based on histogram inspection. There was no evidence of autocorrelation, with a Durbin–Watson statistic of 1.791. No multicollinearity was observed, as the variance inflation factor values ranged from 1.030 to 1.448. Furthermore, the scatterplot of standardized residuals against standardized predicted values showed no evidence of heteroscedasticity.

The overall regression model was statistically significant ($F(10, 379) = 7.162$, $p<0.001$) and explained 15.9% of the variance in knowledge scores ($R^2 = 0.159$; adjusted $R^2 = 0.137$). Participants who had previously heard of bowel or intestinal ischemia had significantly higher knowledge scores than those who had not or were unsure ($B = 4.332$, $t = 7.893$, $p<0.001$). Gender, age, and educational level were not significantly associated with knowledge scores (Table 4).

Discussion

Public knowledge of bowel ischemia among adults in Al-Ahsa was poor. Only 11.0% of participants had heard of the condition, and the mean knowledge score was 3.76 ± 3.56 out of 10. Those who had heard of it learned about it most often from healthcare professionals, followed by internet websites and social media. Participants did better on general principles, such as the need for urgent assessment of sudden, severe, unexplained abdominal pain and the benefit of early diagnosis and treatment, than on the definition and manifestations of the disease; only a quarter recognized blood in the stool as a possible sign. Previous awareness was the only independent predictor of a higher knowledge score, whereas gender, age, and educational level were not significantly associated with knowledge.

These results fit a wider pattern of limited public knowledge of serious abdominal conditions in Saudi Arabia. In a nationwide survey on acute abdominal pain, 87.2% of respondents had poor knowledge, with a mean score of 1.35 ± 1.07 out of 5 [13]. Surveys on pancreatitis reported an overall knowledge level of 46% in the Eastern Province [14] and found in Tabuk that 64.1% of participants had never received information about the disease and that knowledge of its symptoms and risk factors was inadequate [15]. These studies examined different conditions with different questionnaires and scoring systems, so their figures cannot be compared directly, but they point in the same direction. Awareness of bowel ischemia may be especially low because the condition is relatively rare, has limited coverage in public health campaigns, carries unfamiliar terminology, and

has a nonspecific presentation. Clinicians face a similar difficulty: most respondents in a worldwide survey of healthcare professionals reported that the diagnosis of acute mesenteric ischemia is often delayed, which the survey authors attributed partly to the lack of sensitive and specific clinical and laboratory markers [16].

Among participants who had heard of bowel ischemia, healthcare professionals were the most frequent source of information, followed by internet websites and social media. Doctors were likewise the preferred first source of health information for 87.6% of respondents in a Saudi survey of primary care attendees and were completely trusted by 79.3% [17]. Online sources also play a part: university education and internet sources were the main sources of information about pancreatitis in the Eastern Province [14], and internet sources and healthcare providers were the most frequently reported sources in Tabuk [15]. Differences in the questions asked, the populations studied, and local educational activities may explain why the ranking varies. Clinician-written content shared through websites and social media could combine professional credibility with wide reach, and may also reduce exposure to inaccurate or misleading health information.

Although disease-specific knowledge was poor, participants more readily recognized that sudden, severe, unexplained abdominal pain needs urgent assessment and that early diagnosis and treatment improve outcomes. The pancreatitis surveys show a similar split. In Tabuk, knowledge of symptoms and risk factors was inadequate, yet 55.6% of participants said they were very likely to seek medical attention for relevant symptoms and 88.0% believed that greater awareness could promote early detection and prevention [15]; in the Eastern Province, abdominal pain was the most recognized symptom and 85% believed that greater awareness could support earlier detection and prevention [14]. In the nationwide acute abdomen survey, 41.3% of respondents regarded acute abdominal pain as an emergency requiring urgent medical care [13]. The general rule that severe abdominal pain needs prompt assessment may therefore be better understood than the features of individual abdominal diseases. This is clinically relevant for bowel ischemia, because delayed diagnosis of acute mesenteric ischemia remains common [16] and delayed revascularization is independently associated with higher 30-day mortality, more extensive bowel resection, short bowel syndrome, and higher two-year mortality [18]. Reinforcing the need for immediate assessment may help turn this general awareness into earlier presentation, although the present study did not assess how participants would act in a real emergency.

The largest gaps concerned the definition and clinical manifestations of bowel ischemia, particularly the possibility of blood in the stool. A similar difficulty with disease-specific concepts appeared in the nationwide survey, in which only 29.9% of participants correctly identified the meaning of acute abdominal pain [13]. Recognition is difficult in clinical practice as well: the varied mechanisms underlying acute mesenteric ischemia and the lack of sensitive and specific clinical and laboratory markers contribute to delayed diagnosis [16], and atypical presentation, diagnostic uncertainty, and suboptimal imaging delay recognition and treatment [18]. The public may read severe abdominal pain as a general warning sign while attributing blood in the stool to more familiar gastrointestinal conditions rather than to impaired intestinal blood flow. Public education should therefore go beyond abdominal pain and explain, in simple language, that bowel ischemia results from an inadequate intestinal blood supply and may present with gastrointestinal bleeding and other nonspecific symptoms that require urgent professional assessment.

Previous awareness was the only independent predictor of knowledge. After adjustment for gender, age, and educational level, participants who had heard of bowel ischemia scored approximately 4.33 points higher than those who had not or were unsure. Even limited prior exposure to information about the condition may therefore be associated with substantially better disease-specific understanding. In the Eastern Province pancreatitis survey, healthcare personnel, who would be expected to have greater educational and clinical exposure, also had significantly higher knowledge scores than non-healthcare participants, and, as in the present study, knowledge did not differ by gender [14]. The nationwide acute abdomen survey, however, found higher knowledge among younger and male participants [13]; differences in the conditions examined, study populations, inclusion of healthcare workers, questionnaires, scoring methods, and statistical analyses may explain these inconsistencies. The lack of an educational-level effect may partly reflect the predominance of bachelor's degree holders and the exclusion of healthcare professionals and students, and general education may not provide knowledge of a rare and specialized condition without disease-specific information. Because the design was cross-sectional, the direction of the association between previous awareness and knowledge cannot be established; individuals with greater interest in health information may also have been more likely to encounter or remember information about bowel ischemia.

Limitations

This study has several limitations. First, convenience sampling and electronic questionnaire distribution through social media may have introduced selection bias by favoring individuals with internet access, higher educational attainment, or greater interest in health-related topics. The relatively high proportions of female participants and bachelor's degree holders may also have limited the representativeness of the sample. Second, all participants were recruited from Al-Ahsa, and healthcare professionals and students in healthcare-related programs were excluded; therefore, the findings may not be generalizable to other regions or populations. Third, the cross-sectional design prevents causal interpretation of the association between previous awareness and knowledge. Fourth, knowledge was assessed using a self-administered questionnaire, making the responses potentially susceptible to guessing and response bias. Although the questionnaire underwent expert review, translation, pilot testing, and internal-consistency assessment, further psychometric validation may be required. Finally, the study evaluated knowledge rather than actual care-seeking behavior or clinical outcomes; therefore, the responses may not reflect participants' actions during a real medical emergency.

Conclusion

The present study identified a substantial lack of familiarity with bowel ischemia among adults in Al-Ahsa. Most participants had not previously encountered the condition, and their knowledge scores indicated limited understanding of its definition, clinical manifestations, and potential complications. Nevertheless, recognition of the need for urgent assessment of sudden severe abdominal pain and the benefits of early treatment was comparatively better. Previous awareness was the only independent factor associated with greater knowledge, whereas gender, age, and educational level showed no significant associations. These findings support implementing population-wide educational initiatives led by healthcare professionals and delivered through credible websites and social media platforms. Educational messages should particularly address the underlying mechanism of bowel ischemia, high-risk groups, gastrointestinal bleeding as a possible manifestation, and the serious consequences of delayed medical care. Further research involving broader populations and probability-based sampling is recommended to confirm these findings and evaluate the effectiveness of targeted educational interventions.

Declarations

Ethical Approval: The study was approved by the Institutional Review Board of King Faisal University (approval no. KFU-REC-2026-AUG-ETHICS4362; 20 August 2026).

Consent to Participate: Electronic informed consent was obtained from all participants before they completed the questionnaire.

Funding: None.

Conflicts of Interest: The authors declare no conflicts of interest.

Use of Artificial Intelligence: ChatGPT (OpenAI) was used for language editing; the authors take full responsibility for the content.

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