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CLINICAL STUDY

Geriatric mortality risk factors in emergency department for non-traumatic abdominal pain

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ABSTRACT

OBJECTIVES: The study aimed to determine the factors affecting the mortality of geriatric patients presenting to the emergency department with non-traumatic abdominal pain, as well as the associations of these factors with mortality.

BACKGROUND: With the increasing number of elderly patients, early recognition of patients with risk-bearing diagnoses is crucial.

METHODS: This prospective cross-sectional study included 466 patients over 65 years of age who were admitted to THE emergency department of a tertiary hospital and consented to participate. Data was collected on patient demographics, vital signs, chronic diseases, laboratory investigations, diagnoses, disposition, and 30-day mortality.

RESULTS: The results showed that the mean patient age was 74.42 years, with 47.4 % being male and 52.6 % female. 15.6 % of the patients had nonspecific causes. The risk of mortality within one month was 5.797 times higher in patients with neurological diseases and 5.183 times higher in those with a history of surgery. A one-unit decrease in hemoglobin increased the mortality risk by 0.656 times.

CONCLUSION: This study highlights the importance of careful evaluation of elderly patients with neurological diseases, previous surgical history, and anemia in the emergency department with non-traumatic abdominal pain *(Tab. 5, Ref. 18)*. Text in PDF *www.elis.sk*

KEY WORDS: hospital emergency service, aged, abdominal pain, risk factors.

Introduction

Abdominal pain accounts for 5–10 % of all emergency department admissions (1). Although we have advanced diagnostic tools, approximately 25 % of the patients presenting with abdominal pain have an unclear diagnosis that is categorized as nonspecific abdominal pain, and they are discharged from the emergency department (1). Although nonspecific abdominal pain is observed in approximately 40% of those under 50 years of age, this rate is closer to 15 % in the patients over 50 years of age (2). In addition to the physiological changes due to aging, vision and hearing problems, decreased perception, dementia, cerebrovascular events, Alzheimer's disease, and other psychiatric problems create obstacles when communicating with these patients. Anticholinergic and anti-inflammatory drugs are used for chronic diseases and a weak immune system, making it difficult to monitor the symptoms of abdominal pain and to diagnose the underlying disease (3). These factors lead to increased mortality. Geriatric patients with abdominal pain have a six- to eightfold increased mortality compared with the younger population (1). In addition to these factors, 78 % of emergency physicians report having difficulties with managing abdominal pain in older patients (4).

In this study, we examined the characteristics of nontraumatic abdominal pain and emergency admissions, laboratory investigations, and diagnoses of patients over the age of 65 years and the associations of these factors with mortality.

Materials and method

This prospective, cross-sectional study was designed with the approval of Ethics Committee No. 5048 and included patients over 65 years of age who were admitted to the emergency department of a tertiary hospital between December 1, 2018, and June 6, 2019. During the study period, 31,273 patients were referred to our tertiary hospital emergency service. A total of 5,037 patients were older than 65 years. We included patients over 65 years old who presented to the emergency department with nontraumatic abdominal pain. In the patients who provided consent, we evaluated their demographic data, vital signs, abdominal pain accompanying findings, examination findings, chronic diseases, laboratory investigations, diagnoses, disposition, mortality, and treatments. After

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hospitalization and discharge, we assessed the 30-day mortality rates that were obtained from the online national death registry system. This study was conducted between September 1, 2019, and September 7, 2019.

The following laboratory values were obtained: sodium (Na), potassium (K), aspartate aminotransferase (AST), alanine transaminase (ALT), C-reactive protein (CRP), white blood cells (WBCs), neutrophil count (NEUT), hemoglobin concentration (HGB), platelet count (PLT) and international normalized ratio (INR). The patients were divided into two groups according to sex (male and female) and age (66–74 years and 75 years and older). Blood pressure (Hypotension < 90/60 mmHg) and body temperature (36.1–37.5 °C) were also evaluated. The patients who were monitored in the emergency department for 24 hours or more were considered hospitalized. Patients presenting with abdominal pain after trauma and patients without consent were excluded from the study.

The Number Cruncher Statistical System 2007 (Kaysville, UT, USA) was used for the statistical analysis. Continuous variables are expressed as the mean, standard deviation, and 95% confidence interval (CI) or as the median and interquartile range (IQR) according to their distribution pattern, and categorical variables are expressed as the frequency and rate. We used Student's t test for comparisons between normally distributed quantitative variables and the Mann-Whitney U test for comparisons between normally distributed quantitative variables. Pearson's chi-square test and Fisher's exact test were used to compare qualitative data. A backward logistic regression analysis was used to determine the risk factors affecting mortality. We accepted statistical significance as $p < 0.05$.

Results

A total of 1,296 patients presented with nontraumatic abdominal pain. Finally, 192 patients who gave consent were included in this study. Ninety-one of the patients were male (47.4 %). The mean age was 74.42 ± 7.52 years, and 90 (46.9 %) patients were included in the 75 years and older age group.

The most frequent chronic disease was cardiac diseases (MI, CHF), which was present in 73 patients (38 %), followed by hypertension in 70 patients (36.5 %), type 2 diabetes in 64 patients (33.3 %), malignancy in 63 patients (32.8 %), and neurologic diseases (stroke, Alzheimer's disease, dementia) in 29 patients (15.1 %).

When we investigated the patients, 139 (72.4 %) had abdominal pathology, and 23 (12 %) had nonabdominal pathology. Thirty patients (15.6 %) had neither abdominal nor nonabdominal pathologies and were classified as having nonspecific abdominal pain. Sixty-nine patients were discharged from the emergency department (35.9 %), and 123 patients (64.1 %) were hospitalized. Twenty-three of the hospitalized patients (18.7 %) underwent surgery. The rest of the hospitalized patients were treated medically. The 30-day mortality of all patients was 25.5 %.

The most common diagnosis was gastrointestinal hemorrhage (17.9 %), followed by biliary tract diseases (16 %). The specific diagnoses are presented in Table 1. Ten patients (8.1 %) were admitted to the intensive care unit. The accompanying complaints and physical exam findings of the patients are shown in Table 2.

Tab. 1. Specific diagnosis of the patients (n = 162).

	N	%
Gastrointestinal hemorrhage	29	17.9
Biliary tract diseases	26	16.0
Intestinal obstruction	17	10.5
Abdominal hernia	10	6.2
Urinary tract infection	10	6.2
Malignancy	9	5.6
Pneumonia	8	4.9
Sepsis	7	4.3
Acute kidney injury	5	3.1
Inflammatory intestinal diseases	4	2.5
Gastrointestinal system perforation	4	2.5
Hemorrhoids	4	2.5
Diverticulosis	3	1.9
Fecaloma	3	1.9
Pancreatitis	3	1.9
Acute coronary syndrome	2	1.2
Mesenteric ischemia	2	1.2
Perianal abscess	2	1.2
Peritonitis	2	1.2
Acute gastroenteritis	1	0.6
Gastric outlet obstruction	1	0.6
Vesical globe	1	0.6
Intra-abdominal abscess	1	0.6
Intra-abdominal hematoma	1	0.6
Congestive heart failure	1	0.6
Peptic ulcer	1	0.6
Portal vein thrombosis	1	0.6
Pulmonary embolism	1	0.6
Splenic vein thrombosis	1	0.6
Transient ischemic attack	1	0.6

Tab. 2. Complaints and physical exam findings.

	Positive n (%)
Tenderness	151 (78.6)
Defense	48 (25.0)
Nausea/Vomiting	36 (18.8)
Constipation	31 (16.1)
Diarrhea	18 (9.4)
Rebound	17 (8.9)
Dysuria	15 (7.8)

Evaluation of hospitalization and discharge

The rate of hospitalization in the patients with abdominal and nonabdominal reasons for pain was greater than that for the patients with nonspecific pain ($p < 0.05$). The factors associated with hospitalization and mortality are shown in Table 3.

There were no significant differences between the patients who were hospitalized or discharged according to the presence of hypertension, diabetes, cardiac diseases, asthma, chronic kidney disease, embolism, neurological diseases, malignancy, operation, arrhythmia, nausea/vomiting, dysuria, constipation, diarrhea, and tenderness ($p > 0.05$). The rate of hospitalization was significantly

Tab. 3. Factors associated with hospitalization and mortality.

		Outcome			Mortality		
		Discharge	Hospitalization	p	Alive	Deceased	p
Age	Min–Max (Median)	65–90 (73)	64–94 (74)	t: −0.454	64–91 (72)	65–94 (76)	t: −2.604
	Mean ± SD	74.09 ± 7.27	74.60 ± 7.68	0.650	73.60 ± 7.15	76.80 ± 8.13	0.010*
Gender (n, %)	Male	31 (30.7)	70 (69.3)	$\chi2$: 2.546	62 (68.1)	29 (31.9)	χ^2: 3.667
	Female	38 (41.8)	53 (58.2)	0.111	81 (80.2)	20 (19.8)	0.056
Blood pressure (n, %)	≤90/60 mmHg	67 (37.9)	110 (62.1)	$\chi2$: 3.611	137 (77.4)	40 (22.6)	χ^2: 10.177
	>90/60 mmHg	2 (13.3)	13 (86.7)	0.057	6 (40.0)	9 (60.0)	0.003**
Body temperature	Min–Max (Median)	36–38 (36.4)	35–40 (36.6)	t: −2.250	35–40 (36.6)	35–38 (36.4)	t: 2.182
Diagnostic group (n, %)	Abdominal	38 (27.3)	101 (72.7)	$\chi2$: 45.98	107 (77.0)	32 (23.0)	χ^2: 2.719
	Nonabdominal	4 (17.4)	19 (82.6)	0.001**	14 (60.9)	9(39.1)	0.284
	Nonspecific	27 (90.0)	3 (10.0)		22 (73.3)	8 (26.7)	
Outcome (n, %)	Discharge				56 (81.2)	13 (18.8)	χ^2: 2.529
	Hospitalization				87 (70.7)	36 (29.3)	0.112

* p < 0.05; ** p < 0.01

Tab. 4. Association between laboratory results and outcomes.

		Outcome		p	Normal lab ranges
		Discharge	Hospitalization		
Urea	Mean±SD	49.04±26.26	69.98±50.37	0.003**	17–49 mg/dl
Creatinine	Mean±SD	0.98±0.39	1.39±1.30	0.074	0.7–1.2 mg/dl
Total bilirubin	Mean±SD	0.74±0.71	2.07±3.84	0.019*	0.2–1.2 mg/dl
Direct bilirubin	Mean±SD	0.27±0.36	1.35±3.12	0.001**	0.3 mg/dl
AST	Mean±SD	34.12±34.98	97.09±221.85	0.068	<40 IU/L
ALT	Mean±SD	29.27±62.89	59.33±143.18	0.183	< 41 IU/L
CRP	Mean±SD	36.57±47.39	71.20±82.77	0.002**	5 mg/L
WBC	Mean±SD	9.12±5.14	18.56±33.32	0.018*	4.3–10.3 × 103/mm3
NEUT	Mean±SD	6.09±3.58	9.94±8.98	0.001**	2.1–6.1 × 103/mm3
HGB	Mean±SD	11.65±2.10	10.93±2.54	0.048*	13.6–17.2 g/dl
PLT (x103)	Mean±SD	258.08±117.95	251.75±128.20	0.736	156–373 × 103/mm3
INR	Min–Max (Median)	0.8–2.3 (1)	0.8–10 (1.1)	0.001**	

* p < 0.05; ** p < 0.01

higher in the patients with defense and rebound than in the patients without defense and rebound pain (p = 0.004, p < 0.01; p = 0.007, p < 0.01, respectively). The relationships between the laboratory results and outcomes are shown in Table 4.

Evaluation of mortality

We found that the patients who died within one month were older than the surviving patients (p < 0.05). The mortality rate of the male patients was higher than that of the female patients, but this difference was not statistically significant at one month (p = 0.056, p > 0.05).

The mortality rate was higher in the patients with a blood pressure of 90/60 mmHg or less (p = 0.003, p < 0.01). The body temperature of the patients who died within one month was significantly lower than that of the surviving patients (p = 0.030, p < 0.05). There were no significant differences in mortality according to the diagnostic groups and hospitalization/discharge status (p > 0.05). Hypertension, diabetes, cardiac disease, asthma/COPD, chronic renal disease, embolism, operation, arrhythmia, nausea/vomiting, dysuria, diarrhea, defense, rebound, and tenderness did not significantly affect the mortality results (p > 0.05).

Tab. 5. Logistic regression analysis of risk factors affecting mortality.

	p	ODDS	95% CI	
			Lower	Upper
Age	0.006**	1.121	1.033	1.216
Asthma/COPD (+)	0.091	0.099	0.007	1.449
Neurologic Diseases (+)	0.013*	5.797	1.452	23.151
History of Operation (+)	0.014*	5.183	1.392	19.291
Neutrophil (%)	0.063	1.047	0.998	1.100
HGB	0.003**	0.656	0.496	0.868
Constant	0.005**	0.000		

CI: confidence interval; * p < 0.05; ** p < 0.01

The mortality rate within one month was considerably higher in the patients with neurological diseases, malignancy, and constipation (p = 0.010, p < 0.05; p = 0.002, p < 0.05; and p = 0.022, p < 0.05, respectively). Furthermore, the neutrophil and neutrophil (%) values were significantly higher in the patients who died than in the surviving patients (p = 0.017, p < 0.05 and p = 0.014, p < 0.05, respectively). The HGB values of the patients who died within one month were significantly lower than those of the surviving patients (p = 0.015, p < 0.05).

Age, sex, blood pressure, fever, outcome, asthma, neurological disease, malignancy, history of operation, constipation, neutrophils, neutrophils (%), HGB, INR, urea, creatinine, Na, total and direct bilirubin, AST, and CRP variables were evaluated with a backward stepwise logistic regression analysis. At the end of the 17th step, age, neurological disease, operation history, and HGB variables were found to be significant. The explanatory coefficient of the model is 82.8 %, as shown in Table 5.

Discussion

As a result of the increasing geriatric population in the community, the emergency department admissions of the elderly are also increasing. Loğoğlu et al. reported that the admission rate of geriatric patients to emergency departments was 15 % (5), and Durukan et al reported that 13.3 % of all admissions to the emergency department were patients older than 65 years (6). Mert et al reported that patients over 65 years comprised 13.9 % of the total admissions (7). Çam et al reported that this rate was 21.2 % (8). Bedel and Tomruk analyzed geriatric patients who were admitted to the emergency department and noted that 14.2% of the total emergency department admissions were in individuals 65 years and older. In the same study, the most common complaint of those patients was abdominal pain, with a rate of 17.9 % (9). Lamsal and Bhandari reported that geriatric patients comprised 22.15 % of the patients presenting to the emergency department (10). Macaluso and McNamara reported that 9 % of the patients presenting with abdominal pain were 65 years or older (11). Çam et al reported that the rate of geriatric patients presenting to the emergency department with abdominal pain was 4.4 % (8). In this study, we found that 4.1 % of all the patients were patients over 65 years old who presented with abdominal pain.

In a study of 106 patients, Durukan et al reported that the most common accompanying complaint was nausea and vomiting (33 %), and the most common finding in physical examinations was tenderness (36.8 %) (6). Çam et al stated that 49.6 % of patients experienced nausea, whereas Mert et al reported that the inability to remove gas and stool was significant in patients with a surgical diagnosis (7, 8).

Lewis et al reported nonspecific abdominal pain in 14.8 % of patients over 60 years of age (12). Similarly, Bavunoglu and Şirin reported that nonspecific abdominal pain was observed in less than 15% of elderly patients (13). Çam et al (8) reported a nonspecific abdominal pain rate of 11.9 %. Çam et al reported that the most common diagnosis was biliary tract diseases, with a rate of 19.6 %, followed by nonspecific abdominal pain (11.9 %) and malignancy-related abdominal pain (9.8 %) (8). Lewis et al reported specific causes of abdominal pain, with 8.6 % of the patients having urinary tract infections, followed by intestinal obstruction (8 %), gastroenteritis (6.8 %), and diverticulitis (6.5 %). Furthermore, 6.2 % of those patients had biliary duct diseases (12).

Lamsal and Bhandari reported that 23.2 % of their patients were diagnosed with urinary tract infections, followed by 21 % with peptic ulcer disease, 15.5 % with acute gastroenteritis, and 4.3 % with upper gastrointestinal bleeding (10). In our study, the specific causes of abdominal pain were as follows: gastrointestinal hemorrhage (17.9 %), biliary diseases (16 %), intestinal obstruction (10.5 %), and urinary tract infection (6.2 %). In the literature, although the diagnoses can vary according to the population studied, the specific cause is often biliary diseases. In this respect, our results suggest that this may be one of the characteristics of this population.

Pappas et al reported that 8 % of patients aged 65 years and older required surgery, whereas this rate was 9 % in patients younger than 65 years (14). Çam et al reported that 17.6 % of all geriatric patients admitted to the hospital underwent surgery (8).

In their review of the relationship between factors in geriatric patients and the adverse outcomes of emergency services, Carpenter et al reported that the one-year mortality of patients in need of care and those staying at nursing homes was higher than in the patients without these factors (15). Furthermore, in a retrospective cohort study of 800 patients with geriatric cancer hospitalization, Jonna et al reported that the mortality of patients with cognitive impairment was 1.24-fold higher (95% CI: 1.03–1.48) ($p = 0.02$) (16).

Chung et al aimed to predict the 30-day mortality of patients aged 65 years and older who presented to the emergency department with fever (17). They identified three independent factors affecting mortality: leukocytosis (WBC > 12,000/mm^3), severe change of consciousness (GCS ≤ 8), and thrombocytopenia (<150 10^3/mm^3) (17). The *Geriatric Fever Score*, which was developed using these data, reported that the patients' mortality increased if they had at least two of these three factors. In our study, high neutrophils (> 6.1 × 10^3/mm^3), a high neutrophil percentage (> 73 %), and low hemoglobin levels (< 13.6 g/dL) were associated with mortality. Additionally, the patients with high urea (> 49 mg/dL), direct bilirubin (> 0.3 mg/dL), AST (> 40 IU/L), and CRP (> 5 mg/L) levels were associated with high mortality. Gabayan et al reported in a patient–control study that hypotension (systolic blood pressure < 120 mmHg) and pulse rate (> 90 beats/min) were associated with death (18). Additionally, cognitive impairment was associated with poor outcomes in that same study.

A logistic regression analysis of the risk factors affecting mortality showed that a one-unit increase in the age of the patients admitted to the emergency department increased the mortality by 1.121 times (95% CI: 1.033–1.216) within one month. In the patients with neurological diseases, the risk of mortality within one month increased by 5.797 times (95% CI: 1.452–23.151), and in patients with a history of operation, that risk increased by 5.183 times (95% CI: 1.392–19.291). Furthermore, a one-unit decrease in the hemoglobin level of patients increased the one-month mortality by 0.656 times (95% CI: 0.496–0.868).

Although these data do not provide specific findings that can be reflected in the general geriatric population given the broader perspective of the subject, it is clear that a history of neurologic diseases (which increases the need for care of geriatric patients) affects mortality. Further studies with more specific standards are needed to make clear interpretations and to predict the outcomes of geriatric patients, which we studied as a homogeneous population.

Learning points

In conclusion, our study revealed that the main cause of abdominal pain in geriatric patients is gastrointestinal hemorrhage and biliary tract diseases. We found that 25.7% of the total admissions to the emergency department were geriatric patients, and 4.1% of these patients presented with nontraumatic abdominal pain. The one-month mortality was found to be significantly higher in patients with a history of operation or neurological disease.

Although this study was designed prospectively to prevent the data loss that occurs with retrospective (record-based) studies, only patients with informed consent were studied, and not all patients were included. It remains unknown whether the results apply to the general population because this was a single-center study in a tertiary hospital that serves a high-risk population. This study was conducted with only a geriatric population, and no comparisons were made with a younger population. Metabolic markers that may have a significant effect on mortality, such as lactate and arterial base excess, were not evaluated.

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