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Original Article

Establishment of a risk assessment system for peptic ulcer recurrence and its value in individualized intervention

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Abstract: Objective: To investigate the establishment of a risk assessment system for peptic ulcer (PU) recurrence and implement an individualized intervention for PU patients with a moderate to high recurrence risk to reduce the recurrence of PU in patients with a moderate to high recurrence risk. Methods: The factors for PU recurrence were collected through consulting the literature, and a risk prediction model for PU recurrence was established using the univariate binary and multivariate multinomial Logistic stepwise regression analysis. According to the model, a total of 235 PU patients were divided into patients with high, moderate and low recurrence risks. A total of 71 PU patients with moderate to high recurrence risks were selected as the study subjects, and further divided into the control group (n=35) and the experimental group (n=36). The control group was not treated with intervention, while the experimental group was treated with individualized intervention. The PU recurrence, adverse emotions and changes of pain degree were assessed in the two groups at 3, 6, 9 and 12 months after intervention. Results: The univariate and multivariate Logistic regression analysis showed that drinking alcohol, smoking, chronic diseases, oral NSAIDS and depression were associated with the recurrence of PU. Individualized intervention improved the recurrence rate, anxiety, depression, pain degree and quality of life of patients with moderate to high PU recurrence risk. Conclusion: Drinking alcohol, smoking, chronic diseases, oral NSAIDS and depression were associated with the recurrence of PU. Individualized intervention can improve the quality of prognosis and the recurrence risk of PU in patients, which has positive clinical significance.

Keywords: Peptic ulcer, recurrence, risk assessment system, individualized

Introduction

Peptic ulcer (PU) is a common chronic disease which occurs due to an imbalance between aggressive factors (mainly gastric acid and pepsin) and protective factors (mucosal defenses). PU occurs in many parts of the digestive tract, especially in the stomach and duodenum. Worldwide, approximately 5%-10% people suffer from PU, and the annual incidence rate of PU is about 0.1%-0.3% [1, 2]. PU patients usually have a disease course of 6-7 years, and some patients can have a course of disease of 10-20 years. PU patients often have a periodic pain in the upper abdomen during the course of disease, which brings serious burden to the body and mind and reduces their quality of life [3, 4].

In 1984, Mrashall et al. first proposed that *Helicobacter pylori* (Hp) is the pathogenic source of PU. After Hp infection, Hp can lurk in the human gastric mucosa for a long time, leading to acute and chronic inflammatory reactions and releasing bioactive factors, continuously. One study has suggested that the pathogenesis of approximately 80%-90% of all patients with PU and also with duodenal ulcer (DU) may be related to Hp infection [5]. Smoking, poor diet habits, increased gastric acid and long-term use of drugs [e.g., non-steroidal anti-inflammatory drugs (NSAIDs), adrenocortical hormones and reserpine] can lead to PU [6, 7]. Although PU patients can have a good therapeutic effect in a short time after the intervention of diet and drug, PU is likely to relapse. Smoking, stress, previous history of recurrence, duration of dis-

ease and use of NSAIDs has an impact on the recurrence rate of PU [8, 9]. The high recurrence rate of PU has attracted extensive attention of researchers.

The purpose of this study was to retrospectively analyze the recurrence rate of PU in patients who were admitted to our hospital within the past 10 years by comprehensively collecting all risk factors of PU recurrence reported by existing, so as to establish and further assess a risk assessment system of PU through one-year follow-up and individualized intervention for PU patients with ulcers, thereby providing an effective plan for preventing PU recurrence.

Materials and methods

General data

The case data of 1662 PU patients admitted to our hospital from January 2009 to June 2014 were selected as the clinical data for this retrospective study, including 1198 males and 464 females.

In addition, a total of 235 PU patients admitted to our hospital from January 2018 to January 2019 were selected, including 157 male patients and 78 female patients. In accordance with the risk assessment system for PU recurrence, there were 174 patients with a low recurrence risk and 71 patients with moderate to high recurrence risks. In accordance with a random number table, a total of 71 PU patients with moderate to high recurrence risk were divided into the control group (n=35) and the experimental group (n=36). The control group included 25 males and 10 females with a mean age of (69.87 ± 8.32) years, while the experimental group included 22 males and 14 females with a mean age of (67.56 ± 10.64) years. There was no significant difference in the general data (e.g., gender, age and weight) between the two groups ($P > 0.05$), and the general data were comparable.

Inclusion criteria: patients with complete case data; patients aged 18-80 years; patients who were diagnosed with PU by electronic gastroscopy and pathological examination; patients with clear consciousness.

Exclusion criteria: patients with incomplete case data, malignant ulcer, pregnancy or lactation.

The personal files of 71 patients with moderate to high recurrence risk enrolled were established, and their information (e.g., name, gender, age, contact number, address) was registered. All patients signed informed consent forms, and as such patients voluntarily participated in this study. This study has been reviewed and approved by the Ethics Committee of the First Affiliated Hospital of Nanchang University.

Methods

Establishment of the risk assessment system of PU recurrence

Through consulting the literature, the factors for PU recurrence were collected and by conducting follow-ups, the PU recurrence of 1662 cases was investigated. In accordance with the recurrence conditions, a total of 1662 patients were divided into the high recurrence group (n=70, recurrence within 6 months), moderate recurrence group (n=104, recurrence within 6-12 months) and low recurrence group (n=181, recurrence after 12 months).

SPSS 20.0 was adopted for statistical analysis. The differences in every factor were compared among the three groups. The odds ratio (OR) of each factor was calculated by univariate binary Logistic regression analysis, so as to assess its correlation with the risk of PU recurrence. Multivariate multinomial Logistic stepwise regression analysis was used to establish the risk prediction model for PU recurrence.

Individualized intervention and risk assessment system for PU recurrence

The control group was not treated with intervention, but regular telephone follow-ups were conducted to know whether the patients had PU recurrence.

The experimental group was treated with individualized intervention, and a professional team was established to follow the patients' conditions. The specific measures were as follows: (1) Regular public education: Due to the high recurrence rate of PU, PU patients undergoing reexamination in outpatient department were given a brochure, informed of the necessity to follow the precautions and doctor's advice, discontinue the habit of smoking and alcohol drinking, change their bad living habits,

and regularly receive reexamination. (2) Psychological counseling: Patients may have symptoms (e.g., epigastric pain) during their illness. Although drugs can relieve symptoms, they are still prone to relapse. In the course of treatment, PU patients easily have treatment-resistant depression, and adverse emotions tend to induce relapsed and aggravated conditions. Timely psychological counseling was conducted for PU patients with adverse emotions, and exchange meetings for PU patients were held to boost PU patients' confidence and soothe their emotions during treatment. (3) Home nursing: The patients and their families were instructed to monitor their conditions in a timely manner based on the color and shape of feces in daily life. More care and support were given to patients, communication with patients was conducted, and attention was paid to their emotional changes in daily life. (4) Medication guidance: It was recommended that the patients who took NSAIDs for a long time be treated with other options, and the use of NSAIDS should be avoided to reduce the risk of PU recurrence.

Observational indices and assessment criteria

Recurrence conditions in the two groups after individualized intervention: Regular telephone follow-ups were conducted every 3 months to know whether the patients had PU recurrence.

Adverse emotions in the two groups after individualized intervention: The anxiety (Self-Rating Anxiety Scale, SAS) and depression (Self Rating Depression Scale, SDS) in the two groups were scored using the Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HAMD) before and after intervention. The grade scoring method was adopted in HAMA and HAMD. A higher score indicates more serious anxiety and depression [10-12].

Pain degree in the two groups after individualized intervention: Visual analogue scale (VAS) was used to assess the pain degree in both groups. A scale of 10 cm was used for testing, and there was a movable cursor on the scale. Zero indicated no pain, and 10 indicated the greatest degree of pain. Based on the degree of pain, the patients moved the cursor to the corresponding position [13-15]. A higher VSA score indicates a higher degree of pain.

Statistical methods

SPSS 22.0 was used for statistical analysis. The measurement data were expressed using mean ± standard deviation ($\bar{x}$ ± sd), and the differences between groups were compared by t test. $P < 0.05$ indicated a statistically significant difference.

Results

Univariate logistic regression analysis of PU recurrence

There were statistically significant differences in gender, age, drinking alcohol, smoking, chronic diseases, oral NSAIDs, type O blood, physical exercise and depression ($P < 0.05$). Therefore, gender, age, alcohol consumption, smoking, chronic diseases, oral NSAIDS, type O blood, physical exercise and depression were associated with PU recurrence (**Table 1**).

Multivariate logistic regression analysis of PU recurrence

Multivariate Logistic regression analysis was carried out on the significant factors by univariate analysis. The recurrence was taken as the dependent variable, and gender, age, alcohol drinking, smoking, chronic diseases, oral NSAIDs, type O blood, physical exercise and depression were taken as the independent variables. Multivariate Logistic regression analysis showed that alcohol consumption, smoking, chronic diseases, oral NSAIDs and depression were the influencing factors of PU recurrence (**Table 2**).

Comparison of differences between the two groups before intervention

The index comparison suggested that before intervention, the general clinical indices were not statistically significant in the two groups ($P > 0.05$), and as such were comparable (**Table 3**).

Comparison of recurrence conditions between the two groups after individualized intervention

After individualized intervention, the recurrence rate in the experimental group was lower than that in the control group at the same time point (**Figure 1**).

Table 1. Univariate logistic regression analysis of PU recurrence

Variables	B	SE	Wald	*P*	OR	95% CI for Exp (B)	
						Lower	Upper
Gender	-0.399	0.142	7.908	0.005*	0.671	0.508	0.886
Age	0.252	0.116	4.731	0.030*	1.287	1.025	1.614
Ulcer site	-0.083	0.081	1.074	0.300	0.920	0.786	1.077
Course of disease	0.270	0.140	3.686	0.055	1.309	0.994	1.724
Onset season	-0.051	0.051	0.986	0.321	0.950	0.859	1.051
Dietary structure	-0.132	0.130	1.040	0.308	0.876	0.680	1.129
HP infection	0.252	0.162	2.423	0.120	1.287	0.937	1.767
Alcohol drinking	0.368	0.126	8.513	0.004*	1.446	1.129	1.851
Smoking	0.764	0.122	39.552	0.000*	2.148	1.693	2.726
Chronic diseases	1.594	0.132	146.101	0.000*	4.925	3.803	6.377
Oral NSAIDS	3.701	0.232	253.983	0.000*	40.491	25.685	63.831
Type O blood	0.587	0.279	4.438	0.035*	1.798	1.042	3.104
Physical exercise	-0.394	0.107	13.478	0.000*	0.674	0.547	0.832
Anti-HP drugs	-0.121	0.125	0.938	0.333	0.886	0.694	1.132
Psychological pressure	0.237	0.136	3.033	0.082	1.267	0.971	1.655
Anxiety	0.017	0.239	0.005	0.944	1.017	0.637	1.623
Depression	0.709	0.255	7.711	0.005*	2.031	1.232	3.349

*: $P < 0.05$.

Table 2. Multivariate logistic regression analysis of PU recurrence

Variables	B	SE	Wald	*P*	*OR*	95% *CI* for Exp (B)	
						Lower	Upper
Alcohol drinking	0.430	0.167	6.640	0.010	1.537	1.108	2.132
Smoking	1.097	0.165	44.256	0.000	2.994	2.168	4.136
Chronic diseases	0.869	0.159	29.906	0.000	2.386	1.747	3.258
Oral NSAIDS	3.513	0.255	189.885	0.000	33.541	20.351	55.279
Depression	0.718	0.324	4.917	0.027	2.050	1.087	3.865

Table 3. Comparison of indices between the two groups before intervention ($\bar{x}$ ± sd)/[n (%)]

General clinical data		Experimental group (n=35)	Control group (n=36)	t/X^2	*P*
Gender	M	25	22	0.387	0.872
	F	10	14		
Mean age (years)		69.87 ± 8.32	67.56 ± 10.64	0.792	0.489
Mean weight (kg)		58.67 ± 6.31	57.54 ± 7.60	0.189	0.838

Comparison of changes of adverse emotions between the two groups after individualized intervention

The HAMA and SAS scores exhibited that before intervention, the scores were (65.47 ± 8.21) points in the control group and (66.32 ± 9.54) points in the experimental group, respectively ($P > 0.05$). After intervention, the scores in the two groups were markedly lower than those before intervention. At 3, 6, 9 and 12 months after intervention, the SAS scores in the experimental group were (50.46 ± 5.87) points, (41.33 ± 4.29) points, (35.65 ± 4.01) points and (28.75 ± 2.15) points, respectively, and the SAS scores in the control group were (60.35 ± 7.10) points, (51.76 ± 5.18) points, (48.35 ± 6.27) points and (42.64 ± 5.11) points, respectively. There were significant differences in scores between the two groups at the same time point ($P < 0.05$) (**Figure 2**).

The HAMD and SDS scores exhibited that before intervention, the scores were (58.36 ± 7.66) points in the control group and (57.98 ± 8.35) points in the experimental group, respectively ($P > 0.05$). After intervention, the scores

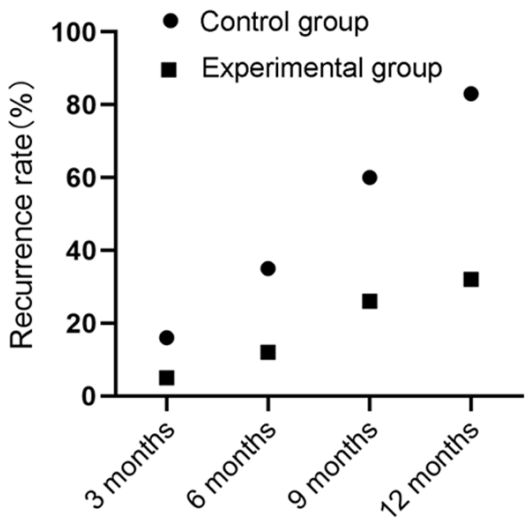

Figure 1. Analysis of recurrence conditions in the two groups after intervention. The comparative analysis showed that the recurrence rate in the experimental group was lower than that in the control group at the same time point after intervention.

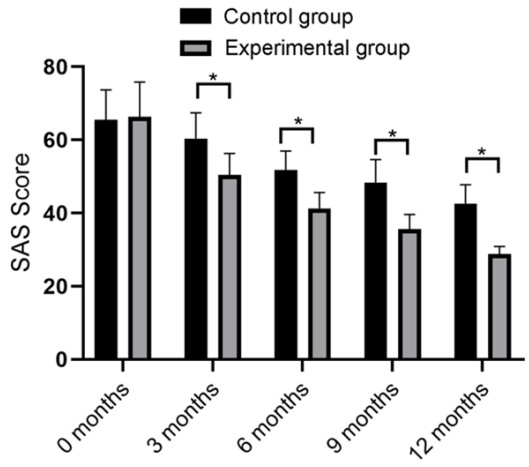

Figure 2. Analysis of changes of SAS scores in the two groups after intervention. The comparative analysis suggested that SAS scores in the experimental group were significantly lower than those in the control group at the same time point after intervention ($P < 0.05$). * indicates a significant difference between groups at the same time point.

in the two groups were markedly lower than those before intervention. At 3, 6, 9 and 12 months after intervention, the SDS scores in the experimental group were (46.63 ± 5.76) points, (38.71 ± 4.69) points, (31.64 ± 3.57) points and (28.93 ± 2.56) points, respectively, and the SDS scores in the control group were (52.13 ± 6.33) points, (48.55 ± 4.92) points, (44.36 ± 5.32) points and (38.10 ± 3.87) points, respectively. There were significant differences in scores between the two groups at the same time point ($P < 0.05$) (**Figure 3**).

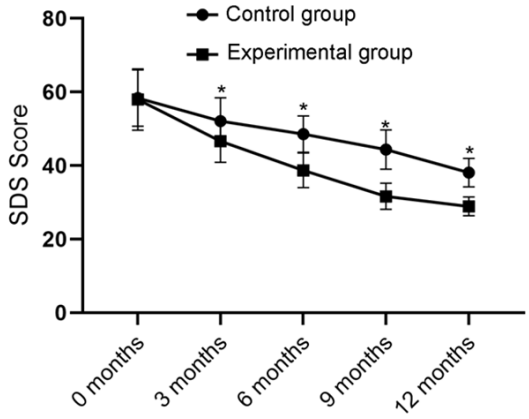

Figure 3. Analysis of changes of SDS scores in the two groups after intervention. The comparative analysis revealed that SDS scores in the experimental group were significantly lower than those in the control group at the same time point after intervention ($P < 0.05$). * indicates a significant difference between groups at the same time point.

Comparison of pain degree between the two groups after individualized intervention

The VAS was used to assess the pain degrees in the two groups. Before intervention, the scores were (5.82 ± 3.09) points in the control group and (5.76 ± 2.87) points in the experimental group, respectively ($P > 0.05$). After intervention, the scores in the experimental group were markedly lower than those before intervention. Compared with those at 6 months before intervention, the scores in the control group decreased after intervention, and increased with the rise in the number of recurrent patients at 9 months after intervention. At 3, 6, 9 and 12 months after intervention, the pain degree scores in the experimental group were (5.53 ± 2.67) points, (4.83 ± 2.03) points, (4.36 ± 1.58) points and (3.55 ± 1.20) points, respectively, and the pain degree scores in the control group were (5.66 ± 2.87) points, (5.63 ± 2.75) points, (6.02 ± 2.06) points and (6.35 ± 2.34) points, respectively. There were remarkable differences in scores between the two groups at 6 months after intervention ($P < 0.05$) (**Figure 4**).

Discussion

PU is a common chronic digestive tract disease. Clinically, PU is mainly treated by inhabi-

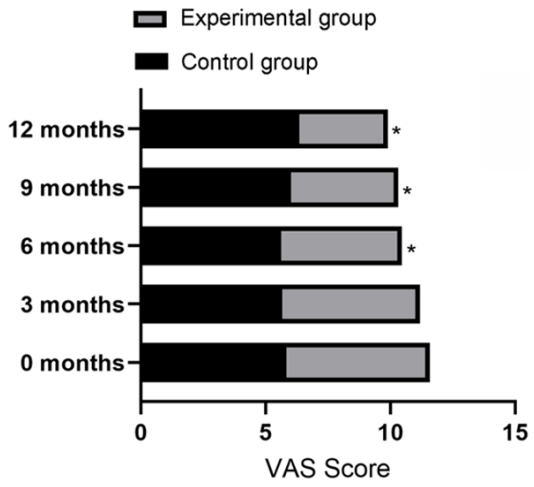

Figure 4. Analysis of changes of VAS scores for pain degrees in the two groups after intervention. The comparative analysis exhibited that VAS scores in the experimental group were decreased gradually after intervention, while those in the control group were increased at 9 months after intervention. At 6, 9 and 12 months after intervention, VAS scores in the experimental group were markedly lower than those in the control group at the same time point ($P < 0.05$). * indicates a significant difference between groups at the same time point.

tation of Hp and proton pump inhibitors (PPI). PU patients receiving this treatment can have good short-term efficacy, and are generally cured within 4-6 weeks if dietary intervention and drug treatment are additionally given. However, PU is prone to relapse. According to statistics, the recurrence rate of PU patients is as high as 25%.

In view of the complex pathogenesis of PU and the easy recurrence of PU patients after recovery, scholars have conducted massive studies. The results showed that invariable factors (e.g., gender, age, season and blood type) may be related to the recurrence of PU [16-19]. In addition, the controllable factors (e.g., Hp infection, oral NSAIDs, adverse lifestyle such as alcohol and smoking, adverse emotions and psychological health), affect the PU recurrence [20-24]. After multiple recurrences of PU in patients, the protection and defense mechanisms of the gastric mucosa is damaged and the treatment effects and prognosis are reduced [25]. Patients who have been plagued by diseases for a long time, have adverse emotions and even resist treatment. Such a vicious circle eventually leads to the death of patients.

In this study, we collected all kinds of risk factors for PU recurrence reported by existing, and retrospectively analyzed the recurrence conditions of PU patients who were admitted to our hospital in the past 10 years, and established a risk prediction model for PU recurrence using univariate binary and multivariate multinomial Logistic stepwise regression analysis. Alcohol consumption, smoking, chronic diseases, oral NSAIDs and depression are associated with the PU recurrence. Patients were classified according to the risk prediction model for PU recurrence. After individualized intervention was performed on PU patients with moderate to high recurrence risks, from the one-year follow-up, it was found that the recurrence rate, anxiety, depression and other adverse emotions, the degree of pain, and the quality of life in the experimental group were remarkably improved.

This study has some shortcomings. (1) Due to the insufficient study sample size and the complex pathogenesis of PU, the risk assessment system for PU recurrence is limited. (2) After individual intervention, the monitoring time for recurrent conditions of PU in patients with moderate to high recurrence risks is relatively short, and the insufficient sample size restricts the conclusions of this study. In view of the aforementioned shortcomings, a more comprehensive study with a larger sample size and added variable factors will be performed, so as to establish a more accurate risk assessment system for PU recurrence through the continuous improvement, thereby providing more effective guidance on the clinical work and a more detailed theoretical basis for the treatment and prognosis of PU in patients.

Disclosure of conflict of interest

None.

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References

[1] Zogovic S, Bojesen AB, Andos S and Mortensen FV. Laparoscopic repair of perforated peptic

ulcer is not prognostic factor for 30-day mortality (a nationwide prospective cohort study). Int J Surg 2019; 72: 47-54.
[2] Motamedi M, Mansour-Ghanaei F, Sariri R and Vesal M. Salivary enzymes in peptic ulcer disease. J Oral Biol Craniofac Res 2013; 3: 83-87.
[3] Torres OJM, Santos OJD, Moura RS, Serra HO, Ramos VP, Melo SPDC and Loureiro CMB. Activity of orbignya phalerata and euterpe edules in the prevention and treatment of peptic ulcer in rats. Arq Bras Cir Dig 2018; 31: e1390.
[4] Wen Z, Li X, Lu Q, Brunson J, Zhao M, Tan J, Wan C and Lei P. Health related quality of life in patients with chronic gastritis and peptic ulcer and factors with impact: a longitudinal study. BMC Gastroenterol 2014; 14: 149.
[5] Bagheri N, Razavi A, Pourgheysari B, Azadegan-Dehkordi F, Rahimian G, Pirayesh A, Shafigh M, Rafieian-Kopaei M, Fereidani R, Tahmasbi K and Shirzad H. Up-regulated Th17 cell function is associated with increased peptic ulcer disease in Helicobacter pylori-infection. Infect Genet Evol 2018; 60: 117-125.
[6] Kavitt RT, Lipowska AM, Anyane-Yeboa A and Gralnek IM. Diagnosis and treatment of peptic ulcer disease. Am J Med 2019; 132: 447-456.
[7] Abbasi J. Barry marshall, MD: H pylori 35 years later. JAMA 2017; 317: 1400-1402.
[8] Dammann HG and Walter TA. Efficacy of continuous therapy for peptic ulcer in controlled clinical trials. Aliment Pharmacol Ther 1993; 7 Suppl 2: 17-25.
[9] Kim BW. Diagnosis and treatment of peptic ulcer disease: present and future perspective. Korean J Gastroenterol 2016; 67: 318-320.
[10] Sun XL, Wang YP, Liu TS, Wu JC and Luo QH. Association of psychosocial factors and platelet 5-HT with peptic ulcer. Sichuan Da Xue Xue Bao Yi Xue Ban 2004; 35: 815-817.
[11] Hamilton M. The assessment of anxiety states by rating. Br J Med Psychol 1959; 32: 50-55.
[12] Zimmerman M, Martinez JH, Young D, Chelminski I and Dalrymple K. Severity classification on the Hamilton Depression Rating Scale. J Affect Disord 2013; 150: 384-388.
[13] Texter EC Jr. Ulcer pain mechanisms. The clinical features of active peptic ulcer disease and implications for therapy. Scand J Gastroenterol Suppl 1987; 134: 1-20.
[14] Hellings IR and Larsen S. ImproWin® in the treatment of gastric ulceration of the squamous mucosa in trotting racehorses. Acta Vet Scand 2014; 56: 13.
[15] Xu Z, Zhang R, Zhang D, Yao J, Shi R, Tang Q and Wang L. Peptic ulcer hemorrhage combined with acute gout: analyses of treatment in 136 cases. Int J Clin Exp Med 2015; 8: 6193-6199.
[16] Sumanen MP, Koskenvuo MJ, Sillanmäki LH and Mattila KJ. Peptic ulcer and childhood adversities experienced by working-aged people. World J Gastroenterol 2009; 15: 3405-3410.
[17] Wu HC, Tuo BG, Wu WM, Gao Y, Xu QQ and Zhao K. Prevalence of peptic ulcer in dyspeptic patients and the influence of age, sex, and Helicobacter pylori infection. Dig Dis Sci 2008; 53: 2650-2656.
[18] Johnson CH, McLean RC, McCallum I, Perren D and Phillips AW. An evaluation of the epidemiology, management and outcomes for perforated peptic ulcers across the North of England over 15 years: a retrospective cohort study. Int J Surg 2019; 64: 24-32.
[19] Kanotra R, Ahmed M, Patel N, Thakkar B, Solanki S, Tareen S, Fasullo MJ, Kesavan M, Nalluri N, Khan A, Pau D, Deeb L, Abergel J and Das A. Seasonal variations and trends in hospitalization for peptic ulcer disease in the united states: a 12-year analysis of the nationwide inpatient sample. Cureus 2016; 8: e854.
[20] Scida S, Russo M, Miraglia C, Leandro G, Franzoni L, Meschi T, De' Angelis GL and Di Mario F. Relationship between Helicobacter pylori infection and GERD. Acta Biomed 2018; 89: 40-43.
[21] Yegen BC. Lifestyle and peptic ulcer disease. Curr Pharm Des 2018; 24: 2034-2040.
[22] Shim YK and Kim N. Nonsteroidal anti-inflammatory drug and aspirin-induced peptic ulcer disease. Korean J Gastroenterol 2016; 67: 300-312.
[23] Melcarne L, García-Iglesias P and Calvet X. Management of NSAID-associated peptic ulcer disease. Expert Rev Gastroenterol Hepatol 2016; 10: 723-733.
[24] Lee YB, Yu J, Choi HH, Jeon BS, Kim HK, Kim SW, Kim SS, Park YG and Chae HS. The association between peptic ulcer diseases and mental health problems: a population-based study: a STROBE compliant article. Medicine (Baltimore) 2017; 96: e7828.
[25] Wang A, Yerxa J, Agarwal S, Turner MC, Schroder V, Youngwirth LM, Lagoo-Deenadayalan S and Pappas TN. Surgical management of peptic ulcer disease. Curr Probl Surg 2020; 57: 100728.