



## Functional Dyspepsia (FD); Prevalence and Relationship with Psychological Disorders among Medical Sciences Students

Seyed Ashkan Tabibzadeh<sup>1</sup>, Ghasem Bordbar<sup>2\*</sup>, Saber Ghasemi<sup>2</sup>, Shole Namazi<sup>3</sup>

<sup>1</sup>MD, Assistant professor of Emergency Medicine, Head of Khalij Fars Trauma and Emergency Medicine Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

<sup>2</sup>Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

<sup>3</sup>Research Center for Behavioral and Neurosciences, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

DOI: 10.24896/jrmds.20186126

### ABSTRACT

The educational environment of medical sciences creates multiple stressful situations; also, psychological disorders are one of causes that are considered for FD. Therefore, this study conducted to investigate the prevalence and relationship of FD with psychological disorders among medical sciences students. This cross-sectional study was conducted on 630 medical sciences students in 2015. Selected participants were evaluated for FD by a general practitioner according to ROME III criteria, and psychological disorders of students were evaluated by a clinical psychologist by using the General Health Questionnaire (GHQ-28). Out of all participants, 120 (20%) participants suffered from FD. There was no significant difference between the two different groups on variables such as age ( $p=0.546$ ), sex ( $p=0.751$ ), marital status ( $p=0.878$ ), residence ( $p=0.113$ ), GPA ( $p=0.080$ ), and years of education ( $p=0.463$ ) as far as FD was concerned. But, there was a significant difference between the different fields on frequency of FD ( $p=0.012$ ). Participants with FD had significantly higher frequencies of general mental disorder ( $p=0.017$ ), somatic symptoms ( $p=0.017$ ), anxiety ( $p=0.000$ ), social dysfunction ( $p=0.003$ ) and depression ( $p=0.007$ ). The prevalence of FD among students was above the average prevalence in general population; these results might be due to the youngness of our study population and high frequency of psychological stress in medical training environments. Also, frequency of psychological disorders in FD patients was notably higher than healthy individuals.

**Keywords:** Functional Dyspepsia, Psychological Disorders, Medical Students

**HOW TO CITE THIS ARTICLE:** Seyed Ashkan Tabibzadeh, Ghasem Bordbar, Saber Ghasemi, Shole Namazi, Functional Dyspepsia (FD); Prevalence and Relationship with Psychological Disorders among Medical Sciences Students, J Res Med Dent Sci, 2018, 6 (1): 161-168, DOI: 10.24896/jrmds.20186126

**Corresponding author:** Ghasem Bordbar

**e-mail:** bordbarghasem1@yahoo.com

**Received:** 22/08/2017

**Accepted:** 07/01/2018

percent for FD, The difference of dyspepsia prevalence is mostly related to different diagnostic criteria and populations [6, 7].

### INTRODUCTION

Dyspepsia is defined as episodic discomfort in the epigaster caused by the upper digestive system [1]. Almost, a quarter of dyspepsia cases occur following organic disorders such as peptic ulcers, gastric malignancies, gastroesophageal reflux disease, NSAID consumption and biliary colics. On the other hand, diagnostic evaluations find no underlying causes in about 75 percent of cases [2-5]. Studies have reported a prevalence of 11-29.2

Stress and mental disorders such as anxiety, depression are frequently reported among patients with functional disorders of the gastrointestinal system [7-12], and psychological disorders may worsen dyspepsia symptoms and have negative effects on treatment [7, 13]. The educational environment of medical sciences creates multiple stressful situations and poses harmful effects on academic performance, physical and mental health, As Liselotte *et al* conducted a study on 2246 medical students and

reported that 82 percent of the students had at list one mental distress [14-16]. Therefore, it can be assumed that the environment can increase FD.

Due to our knowledge, a few studies have been conducted to investigate FD and their association with psychological disorders among medical sciences students [11, 12, 17-21]. Due to the importance of the disease and its relationship with the physical and mental health, this study was designed to investigate the prevalence of FD and their association with the psychological disorders in Hormozgan University of Medical Sciences.

### MATERIALS AND METHODS

This was a cross-sectional study with stratified random sampling. According to the previous studies, prevalence of dyspepsia and psychological disorders were 20 percent and 28 percent respectively [7, 22-24], and they were used to calculate the sample size by means of Cochran's sample size formula. Confidence interval and test power of 95% were taken into consideration and the sample size was calculated as 630 people. As regards, the sample size of 630 people comprised approximately 30 percent of the total number of students. Regarding the stratified sampling method used in the study, 30 percent of each class of university students randomly entered the study. Thus, medical students from the 1st year to the 7th year were divided into 7 classes and paramedical students (all majors) from the 1st year to the 4th year were divided into 4 classes. Inclusion criteria were having completed at least one semester in the university and giving consent to participate in the study. Exclusion criterion was lack of cooperation during the study period (not filling the questionnaire completely or lack of cooperation in the study process). Finally, all the eligible participants were visited by a general physician in order to assess FD using ROME III criteria. In addition, a clinical psychologist (without knowledge of the result of the interview with the general physician) evaluated the students regarding psychological disorders by means of GHQ (General Health Questionnaire); a 28-item questionnaire. Then, those with FD according to ROME III criteria and those without FD were evaluated and compared regarding general mental disorder and sub-scales of depression, anxiety, social dysfunction and somatic symptoms.

A checklist was distributed to all participants to collect demographic data such as age, gender, GPA, field of study, year of education and residence.

ROME III criteria defines FD as the presence of Postprandial distress syndrome (postprandial early satiation and fullness) with, or Epigastric pain syndrome (unexplained epigastric pain of burning which would not resolve after defecation), for three months in the past six months without any of the following characteristics: consuming nonsteroid anti-inflammatory drugs (NSAIDs) or antibiotics two weeks prior to study, peptic ulcer symptoms (burning pain in the epigaster which increases during the night and wakes up the patients), gastroesophageal reflux disease symptoms (heartburn, acid regurgitation), gastrointestinal malignancy symptoms (unexplained significant weight loss, loss of appetite, frequent vomiting, dysphagia, odynophagia, family history of gastrointestinal malignancies or lower gastrointestinal bleeding) [11, 17-19, 21, 25-29].

28-item General Health Questionnaire (GHQ-28): GHQ-28 was used to evaluate mental health. GHQ-28 has been divided into four subscales. These are: somatic symptoms (items 1-7); anxiety (items 8-14); social dysfunction (items 15-21), and depression (items 22-28). In this study Goldberg's conventional scoring was used which is in the form of 1-1-0-0. This means choices A and B get a score of 0 and choices C and D get a score of 1. Therefore, if each of the 28 symptoms were more than usual the score of 1 is allocated to each and the maximum score will be 28. If the sum of the scores one gets is six or more, that person lacks mental health. In addition, a score of two or more in the field of depression, anxiety, social dysfunction and somatic symptoms means a disorder in that field. According to previous studies, this questionnaire enjoys reliability and validity [30-34]. The sensitivity and specificity of the Persian translation of GHQ-28 has also reported to be 84.7% and 93.8%, respectively. The Persian translation also has a high reliability and Cronbach's alpha of 0.85 [31, 35, 36]. Data were analyzed using SPSS v. 20 software using descriptive statistics such as mean, standard deviation (SD), frequency and percent, t-test for quantitative variables and chi square for qualitative variables.

## RESULTS

Six hundred out of 630 distributed questionnaires were completed correctly (response rate was 95.23%). Out of 600 studied students, 220 (36.7%) were males and 380 (63.3%) were females. The participants were between 16-40 years old with the mean age of  $21.58 \pm 2.12551$ . Based on the Rome III criteria, 120 participants (20%) were diagnosed with FD with the CI of 95%. Among those with FD, 14 (11.7%) and 113 participants (94.2%) were with Epigastric pain syndrome (EPS) and Postprandial distress syndrome (PDS), respectively.

### **Relationship between Demographic Variables and FD**

The mean ages of those with FD and the ones without it were  $21.47 \pm 1.82$  and  $21.60 \pm 2.19$ , respectively ( $p=0.546$ ). The differences were not statistically significant. FD frequencies in males and females were 19.1% ( $n=42$ ) and 20.5% ( $n=78$ ), respectively ( $p=0.751$ ). The differences were not statistically significant. There was no significant difference between the two different groups on variables such as marital status ( $p=0.878$ ), residence ( $p=0.113$ ), GPA ( $p=0.080$ ), and years of education ( $p=0.463$ ) as far as FD was concerned. However, Table 1 shows a significant difference between the different fields on frequency of FD.

**Table 1: Prevalence of FD in different fields**

Field	Without FD (%)number	With FD (%)number	P-value
Medical	(75.4%)-107	(24.6%)-35	0.012
Dentistry	(36%)-75	(25%)-12	
Paramedical	(79.3%)-237	(20.7%)-62	
Health	(90.1%)-100	(9.9%)-11	

### **Relationship between Psychological Disorders with FD**

Based on the statistical analysis, mean ages of those with FD was  $21.47 \pm 1.82$  and mean age of the control group was  $21.52 \pm 1.91$ , which did not have a statistically significant difference ( $p=0.836$ ). Table 2 shows a significant difference between the control and FD groups on general mental disorder. Moreover, a statistically significant difference was found on GHQ test subscales between the FD and control groups on somatic symptoms, anxiety, social dysfunction, and depression scales. Mean of the FD group exceeded the one of control group.

**Table 2: Relative frequency of somatic symptoms, anxiety, depression, social dysfunction, and general mental disorder in those with functional dyspepsia and control group**

	Control (%)number	FD (%)number	P-value
General mental disorder	(14.2%)-17	(27.5%)-33	0.017
Somatic symptoms	(18.3%)-22	(32.5%)-39	0.017
Anxiety	(26.7%)-32	(52.5%)-63	0.000
Social dysfunction	(18.3%)-22	(35.8%)-43	0.003
Depression	(16.7%)-20	(32.5%)-39	0.007

## DISCUSSION

Based on this study, 120 participants (20%) were with FD with the CI of 95%. It reported FD frequencies in America, European countries, East Asian countries as 15% [37], 23.8-14.7% [38, 39], and 17-2.4% [40, 41] respectively. Generally, the review study of Mahadeva *et al.* in 2006 reported it as 29.2-11% throughout the world [6]. The studies in Iran reported FD frequency as 16% [24, 42]; however, most of the studies were conducted using old criteria such as Rome I and Rome II. Since FD are varied considerably in their diagnosis based on the used criteria [6, 43, 44], a correct comparison cannot be made between the results and the ones of present study. For example, a study in Taiwan showed FD based on Rome I and Rome II as 8.23% and 8.11%, respectively [43].

The studies by using the Rome III criteria on a general population, in Taiwan, Iran, and Sweden showed FD frequencies as 5.3%, 12.6-16%, and 15.7%, respectively. In all cases, the rates are lower than the ones of our study [11, 12, 42, 45-47]. A significant relationship was observed between FD and mental disorders [48-50]. Mental stresses were also discussed as the potential causes of FD [50-53]. Therefore, larger frequency of FD among medical sciences students as compared with the general population might be because of high frequency of psychological stress in medical training environments [14, 15]. Also, based on the previous studies, prevalence of dyspepsia is higher in youngsters than it is in other age groups [6, 54, 55]; however, this may be due to a younger study population.

The study of Dong *et al.* on medical and non-medical students in China using Rome III criteria reported FD frequency as 9.25% [52], which is

consistent with our study. The results of past Studies about FD symptoms showed that PDS frequency was more than the one of EPS, which is consistent with our study [11, 12, 45-47, 56, 57]. Previous studies in Iran and in the world, frequently reported the higher prevalence of FD in women than in men [6, 7, 12, 20, 24, 45]. The results of the current study were in concordance with the previous studies; however, contradictory to the study conducted by Dong *et al* on university students, the statistical difference in our study was not significant which may be due to the characteristics of the population of the current study; because of their direct contact with the healthcare system, they would pay more attention to the disease symptoms and therefore the role of sex will be eliminated from the study. On the other hand, it has been shown that women pay more attention to their health, more frequently seek medical consult and go to healthcare centers and that is why their disease is diagnosed earlier [58-60]. However, our study population did not only include those who were referred to or those attending healthcare centers. According to the study conducted by Li Mang on non-medical students, dyspepsia was significantly more prevalent in women than in men [57].

According to a study on general population in Hong Kong, there was no significant relationship between marital status and dyspepsia [45]. In the current study, considering variables such as place of residence, GPA and marital status, there was no significant difference among different groups regarding functional dyspepsia. In our study, there was not a significant difference among different years of university studies regarding functional dyspepsia which was in concordance with the study by Dong *et al* on medical and non-medical university students in China [52]. However, in the study conducted by Li Mang on non-medical students, significantly more students in their last year of university studies suffered from this condition [57]. However, there was a significant difference regarding functional dyspepsia among different university majors.

The results of our study demonstrate that the prevalence of mental health disorders and subscales of GHQ-28 such as somatic symptoms, anxiety, social dysfunction and depression were significantly higher in people with functional dyspepsia.

A significant relationship was also seen between functional gastrointestinal disorders (FGID) such as functional dyspepsia and mental disorders such as anxiety, depression, and non-GI physical complaints. Anxiety and depression were also discussed as the predictive risk factors of dyspepsia [7, 11, 45, 61]. Heon-Jeong Lee *et al.*, and De la Roca-Chiapas *et al.* studied functional dyspepsia using ROME criteria and Beck to examine individuals and proved a significant relationship between depression and anxiety and functional dyspepsia [53, 62]. The study of Branka F. Filipović on anxiety and depression of individuals using Hamilton Depression and Anxiety Rating Scales showed that the mean score of the depression and anxiety of those with functional dyspepsia was significantly higher than the one of healthy individuals [63].

In contradiction, in the study conducted by Kalixanda which used ROME III criteria to assess people regarding dyspepsia and Hospital Anxiety and Depression Scale (HADS) to evaluate people regarding depression and anxiety, functional dyspepsia was significantly related to anxiety but it had no significant relationship with depression; however, average depression score of people with functional dyspepsia was reported to be higher than healthy individuals [11]. Accordingly, based on the results of most of the studies done using different methods and criteria, we can conclude that there is a relationship between functional dyspepsia and both anxiety and depression.

Several studies reported a strong relationship between functional dyspepsia and social dysfunction, reduced quality of life, non-GI somatic symptoms, and somatoform disorder [9, 64-68]. For example, the study of T. Tangen Han *et al.* showed that physical complaints of those with functional dyspepsia were significantly higher than the ones of healthy individuals. The complaints consisted of different symptoms such as fatigue, musculoskeletal symptoms, and cardiac and dyspeptic symptoms [9]. In this study, absences of the individuals with functional dyspepsia due to illness were significantly higher than the ones of healthy individuals. Several studies have discussed increased visceral sensitivity as one of possible causes of dyspepsia symptoms. Although the cause of increased sensitivity is still unknown, the studies enumerated increased sensitivity following inflammation and gastrointestinal tract infection,

impaired gastric accommodation, abnormal fundic phasic contractions, stress and stress and associated psychological disorders, and changes in central sensory processing as some possible causes [69]. Remarkable coincidence and overlapping among somatoform disorders such as somatization and fibromyalgia with dyspepsia symptoms [70], emphasize some of above-mentioned causes on increased visceral sensitivity among dyspeptic patients that are not related to the lining of the gastrointestinal tract such as stress, associated psychological disorders and changes in central sensory processing. This assumption is consistent with the results obtained by Vandenberghe *et al.* They proved that increased visceral sensitivity might have originated in an organ other than GI tract lining (gut) and it might have involved a multimodal pathway [71].

### CONCLUSION

The prevalence of FD among students was above the average prevalence in general population, this results might be due to the youngness of our study population and high frequency of psychological stress in medical training environments. Also, frequency of psychological disorders in FD patients was notably higher than healthy individuals. Based on the literature, a relief from dyspepsia might improve the general mental health and a more relaxed environment might decrease dyspepsia. Since both conditions might impact health quality services, they can impact the overall health of general population.

### REFERENCES

1. Barbara L, Camilleri M, Corinaldesi R, Crean GP, Heading RC, Johnson AG, Malagelada JR, Stanghellini V, Wienbeck M. Definition and investigation of dyspepsia. *Digestive Diseases and Sciences*. 1989;34(8):1272-76.
2. Jones MP. Evaluation and treatment of dyspepsia. *Postgraduate Medical Journal*. 2003;79(927):25-29.
3. Talley NJ, Silverstein MD, Agréus L, Nyrén O, Sonnenberg A, Holtmann G. AGA technical review: evaluation of dyspepsia. *Gastroenterology*. 1998;114(3):582-95.
4. Bytzer P, Talley NJ. Dyspepsia. *Annals of Internal Medicine*. 2001;134(9\_Part\_2):815-22.
5. Malagelada J-R. Functional dyspepsia: Insights on mechanisms and management strategies. *Gastroenterology Clinics of North America*. 1996;25(1):103-12.
6. Mahadeva S, Goh K-L. Epidemiology of functional dyspepsia: a global perspective. *World Journal of Gastroenterology*. 2006;12(17):2661.
7. Savas LS, White DL, Wieman M, Daci K, Fitzgerald S, Laday Smith S, et al. Irritable bowel syndrome and dyspepsia among women veterans: prevalence and association with psychological distress. *Alimentary Pharmacology & Therapeutics*. 2009;29(1):115-25.
8. Drossman DA, Camilleri M, Mayer EA, Whitehead WE. AGA technical review on irritable bowel syndrome. *Gastroenterology*. 2002;123(6):2108-31.
9. Haug TT, Svebak S, Wilhelmsen I, Berstad A, Ursin H. Psychological factors and somatic symptoms in functional dyspepsia. A comparison with duodenal ulcer and healthy controls. *Journal of Psychosomatic Research*. 1994;38(4):281-91.
10. Lydiard RB. Irritable bowel syndrome, anxiety, and depression: what are the links? *Journal of Clinical Psychiatry*. 2001;62(Suppl8), 38-45.
11. Aro P, Talley NJ, Ronkainen J, Storskrubb T, Vieth M, Johansson SE, et al. Anxiety is associated with uninvestigated and functional dyspepsia (Rome III criteria) in a Swedish population-based study. *Gastroenterology*. 2009;137(1):94-100.
12. Barzkar M, Pourhoseingholi MA, Habibi M, Moghimi-Dehkordi B, Safaei A, Pourhoseingholi A, Khalafii A, Zali MR. Uninvestigated dyspepsia and its related factors in an Iranian community. *Saudi Medical Journal*. 2009;30(3):397-402.
13. Bennett E, Tennant C, Piesse C, Badcock C, Kellow J. Level of chronic life stress predicts clinical outcome in irritable bowel syndrome. *Gut*. 1998;43(2):256-61.
14. Sherina M, Rampal L, Kaneson N. Psychological stress among undergraduate medical students. *Medical Journal of Malaysia*. 2004;59(2):207-11.
15. Mosley Jr TH, Perrin SG, Neral SM, Dubbert PM, Grothues CA, Pinto BM. Stress, coping, and well-being among third-year medical students. *Academic Medicine*. 1994;69(9):765-67.
16. Dyrbye LN, Harper W, Durning SJ, Moutier C, Thomas MR, Massie Jr FS, et al. Patterns of

- distress in US medical students. *Medical Teacher*. 2011;33(10):834-9.
17. Hsu Y-C, Liou J-M, Yang T-H, Hsu W-L, Lin H-J, Wu H-T, et al. Proton pump inhibitor versus prokinetic therapy in patients with functional dyspepsia: is therapeutic response predicted by Rome III subgroups? *Journal of Gastroenterology*. 2011;46(2):183-90.
  18. Drossman DA, Dumitrascu DL. Rome III: New standard for functional gastrointestinal disorders. *Journal of Gastrointestinal and Liver Diseases*. 2006;15(3):237.
  19. Drossman DA. The functional gastrointestinal disorders and the Rome II process. *Gut*. 1999;45(suppl 2):II1-II5.
  20. Amini E, Keshteli AH, Jazi MSH, Jahangiri P, Adibi P. Dyspepsia in Iran: SEPAHAN systematic review No. 3. *International journal of preventive medicine*. 2012;3(Suppl1):S18.
  21. Yazdanbod A, Shahbaz ZB, Dindar OA, Pourmohammadjan N, Habibzadeh S. Frequency of H. Pylori infection in dyspeptic patients by bacterial antigen in stool. 2013. Volume 17, Number 59;37-40.
  22. Dadkhah BAM, Mohammad Mozaffari, Naser. Mental Health Status of the Students in Ardabil University of Medical Sciences, 2004. *Journal of Ardabil University of Medical Sciences*. 2006;6(1):31-36.
  23. Amin KM, Pakmehr H. The relationship between students'critical thinking and mental health in Mashhad University of Medical Sciences. *The Quarterly Journal of Fundamentals of Mental Health*. 2011. Volume 13, Number 2 (50); 114-123.
  24. Majlesi A, MANI KK, Karimi M. Prevalence of dyspepsia in rural districts of Hamadan City in 2002. *Scientific Journal of Hamadan University of Medical Sciences and Health Services*. 2004(1):47-53.
  25. Tack J, Talley NJ, Camilleri M, Holtmann G, Hu P, Malagelada JR, Stanghellini V. Functional gastroduodenal disorders. *Gastroenterology*. 2006;130(5):1466-79.
  26. Wanebo HJ, Kennedy B, Chmiel J, Steele Jr G, Winchester D, Osteen R. Cancer of the stomach. A patient care study by the American College of Surgeons. *Annals of surgery*. 1993;218(5):583.
  27. Longstreth GF. Approach to the patient with dyspepsia. *UpToDate* Waltham, MA: UpToDate, 2011.
  28. Diaz-Rubio M, Moreno-Elola-Olaso C, Rey E, Locke Gr, Rodriguez-Artalejo F. Symptoms of gastro-oesophageal reflux: prevalence, severity, duration and associated factors in a Spanish population. *Alimentary Pharmacology & Therapeutics*. 2004;19(1):95-105.
  29. Talley NJ. American Gastroenterological Association medical position statement: evaluation of dyspepsia. *Gastroenterology*. 2005;129(5):1753-55.
  30. Noorbala A, Mohammad K. The validation of general health questionnaire-28 as a psychiatric screening tool. *Hakim Research Journal*. 2009;11(4):47-53.
  31. Noorbala A, Yazdi SB, Yasamy M, Mohammad K. Mental health survey of the adult population in Iran. *The British Journal of Psychiatry*. 2004;184(1):70-73.
  32. Cheung P, Spears G. Reliability and validity of the Cambodian version of the 28-item General Health Questionnaire. *Social Psychiatry and Psychiatric Epidemiology*. 1994;29(2):95-99.
  33. Goldberg DP. The detection of psychiatric illness by questionnaire: A technique for the identification and assessment of non-psychotic psychiatric illness, 1972.
  34. Fones C, Kua E, Ng T, Ko S. Studying the mental health of a nation: a preliminary report on a population survey in Singapore. *Singapore Medical Journal*. 1998;39(6):251-55.
  35. Noorbala A, Mohammad K, Bagheri Yazdi S. Validation of GHQ-28 in Iran. *Hakim*. 1999;5:101-10.
  36. Malakouti SK, Fatollahi P, Mirabzadeh A, Zandi T. Reliability, validity and factor structure of the GHQ-28 used among elderly Iranians. *International Psychogeriatrics*. 2007;19(04):623-34.
  37. Shaib Y, El-Serag HB. The prevalence and risk factors of functional dyspepsia in a multiethnic population in the United States. *The American Journal of Gastroenterology*. 2004;99(11):2210-16.
  38. Jones R, Lydeard S, Hobbs F, Kenkre J, Williams E, Jones S, et al. Dyspepsia in England and Scotland. *Gut*. 1990;31(4):401-05.
  39. Bernersen B, Johnsen R, Straume B. Non-ulcer dyspepsia and peptic ulcer: the distribution in a population and their relation to risk factors. *Gut*. 1996;38(6):822-25.
  40. Hirakawa K, Adachi K, Amano K, Katsube T, Ishihara S, Fukuda R, et al. Prevalence of non-ulcer dyspepsia in the Japanese population.

- Journal of Gastroenterology and Hepatology. 1999;14(11):1083-87.
41. Zhao Y, Zou D, Wang R, Ma X, Yan X, Man X, et al. Dyspepsia and irritable bowel syndrome in China: a population-based endoscopy study of prevalence and impact. *Alimentary Pharmacology & Therapeutics*. 2010;32(4):562-72.
  42. Seyedmirzaei SM, Haghdoost AA, Afshari M, Dehghani A. Prevalence of Dyspepsia and its Associated Factors Among the Adult Population in Southeast of Iran in 2010. 2014.
  43. Lu C-L, Lang H-C, Chang F-Y, Chen C-Y, Luo J-C, Wang S-S, et al. Prevalence and health/social impacts of functional dyspepsia in Taiwan: a study based on the Rome criteria questionnaire survey assisted by endoscopic exclusion among a physical check-up population. *Scandinavian Journal of Gastroenterology*. 2005;40(4):402-11.
  44. Ford AC, Marwaha A, Sood R, Moayyedi P. Global prevalence of, and risk factors for, uninvestigated dyspepsia: a meta-analysis. *Gut*. 2015;64(7):1049-57.
  45. Mak A, Wu J, Chan Y, Chan F, Sung J, Lee S. Dyspepsia is strongly associated with major depression and generalised anxiety disorder-a community study. *Alimentary Pharmacology & Therapeutics*. 2012;36(8):800-10.
  46. Chang FY, Chen PH, Wu TC, Pan WH, Chang HY, Wu SJ, Yeh NH, Tang RB, Wu LT, James FE. Prevalence of functional gastrointestinal disorders in Taiwan: questionnaire-based survey for adults based on the Rome III criteria. *Asia Pacific Journal of Clinical Nutrition*. 2012;21(4):594-600.
  47. Esmailzadeh A, Keshteli AH, Tabesh M, Feizi A, Adibi P. Smoking Status and Prevalence of Upper Gastrointestinal Disorders. *Digestion*. 2014;89(4):282-90.
  48. Ålander T, Svärdsudd K, Johansson S-E, Agréus L. Psychological illness is commonly associated with functional gastrointestinal disorders and is important to consider during patient consultation: a population-based study. *BMC Medicine*. 2005;3(1):8.
  49. Koloski NA, Talley NJ, Boyce PM. Epidemiology and health care seeking in the functional GI disorders: a population-based study. *The American Journal of Gastroenterology*. 2002;97(9):2290-99.
  50. Drossman DA, Creed FH, Olden KW, Svedlund J, Toner BB, Whitehead WE. Psychosocial aspects of the functional gastrointestinal disorders. *Gut*. 1999 Sep 1;45(suppl 2):II25-30.
  51. Levy RL, Olden KW, Naliboff BD, Bradley LA, Francisconi C, Drossman DA, Creed F. Psychosocial aspects of the functional gastrointestinal disorders. *Gastroenterology*. 2006;130(5):1447-58.
  52. Dong YY, Chen FX, Yu YB, Du C, Qi QQ, Liu H, Li YQ. A school-based study with Rome III criteria on the prevalence of functional gastrointestinal disorders in Chinese college and university students. *PLoS One*. 2013;8(1):e54183.
  53. De la Roca-Chiapas JM, Solís-Ortiz S, Fajardo-Araujo M, Sosa M, Córdova-Fraga T, Rosa-Zarate A. Stress profile, coping style, anxiety, depression, and gastric emptying as predictors of functional dyspepsia: a case-control study. *Journal of Psychosomatic Research*. 2010;68(1):73-81.
  54. Heading R. Prevalence of upper gastrointestinal symptoms in the general population: a systematic review. *Scandinavian Journal of Gastroenterology*. 1999;34(Supplement 231):3-8.
  55. Drossman DA, Li Z, Andruzzi E, Temple RD, Talley NJ, Thompson WG, Whitehead WE, Janssens J, Funch-Jensen P, Corazziari E, Richter JE. US householder survey of functional gastrointestinal disorders. *Digestive Diseases and Sciences*. 1993;38(9):1569-80.
  56. Hu J, Yang Y, Peng L, SUN G, GUO X, WANG W-F. Investigation of the risk factors of FD in Beijing university students. *Acta Acad Med Mil Tertiae*. 2009;31(15):1498-501.
  57. Li M, Lu B, Chu L, Zhou H, Chen M-Y. Prevalence and characteristics of dyspepsia among college students in Zhejiang Province. *World journal of Gastroenterology: WJG*. 2014;20(13):3649.
  58. TAN YM, Goh KL, Muhidayah R, Ooi CL, Salem O. Prevalence of irritable bowel syndrome in young adult Malaysians: a survey among medical students. *Journal of Gastroenterology and Hepatology*. 2003;18(12):1412-6.
  59. Semnani S, Abdolahi N, Roshandel G, Besharat S, Keshtkar A, Moradi A, et al. Irritable bowel syndrome in students of Golestan University of Medical Sciences. *Govarehsh*. 2012;11(4):249-54.
  60. Reza Hosseini O, Seyed MS, Sayyadi AA, Sataei MS. Frequency of irritable bowel syndrome

- among students of Rafsanjan University of Medical Sciences; 2008-2009.
61. Henningsen P, Zimmermann T, Sattel H. Medically unexplained physical symptoms, anxiety, and depression: a meta-analytic review. *Psychosomatic Medicine*. 2003;65(4):528-33.
62. Lee HJ, Lee SY, Kim JH, Sung IK, Park HS, Jin CJ, Kang SG, Yoon H, Chun HJ. Depressive mood and quality of life in functional gastrointestinal disorders: differences between functional dyspepsia, irritable bowel syndrome and overlap syndrome. *General Hospital Psychiatry*. 2010;32(5):499-502.
63. Filipović BF, Randjelovic T, Ille T, Markovic O, Milovanović B, Kovacevic N, et al. Anxiety, personality traits and quality of life in functional dyspepsia-suffering patients. *European Journal of Internal Medicine*. 2013;24(1):83-86.
64. Jones MP, Sharp LK, Crowell MD. Psychosocial correlates of symptoms in functional dyspepsia. *Clinical Gastroenterology and Hepatology*. 2005;3(6):521-28.
65. Barry S, Dinan TG. Functional dyspepsia: are psychosocial factors of relevance? *World Journal of Gastroenterology*. 2006;12(17):2701.
66. Gathaiya N, Locke Iii GR, Camilleri M, Schleck CD, Zinsmeister AR, Talley NJ. Novel associations with dyspepsia: a community-based study of familial aggregation, sleep dysfunction and somatization. *Neurogastroenterology & Motility*. 2009 Sep 1;21(9):922.
67. Mujakovic S, De Wit NJ, Van Marrewijk CJ, Fransen GA, Laheij RJ, Muris JW, Samsom M, Grobbee DE, Jansen JB, Knottnerus JA, Numans ME. Psychopathology is associated with dyspeptic symptom severity in primary care patients with a new episode of dyspepsia. *Alimentary Pharmacology & Therapeutics*. 2009;29(5):580-88.
68. Jones MP, Schettler RA, Olden K, Crowell MD. Alexithymia and somatosensory amplification in functional dyspepsia. *Psychosomatics*. 2004;45(6):508-16.
69. Li X, Cao Y, Wong R, Ho K, Wilder-Smith C. Visceral and somatic sensory function in functional dyspepsia. *Neurogastroenterology & Motility*. 2013;25(3):246-e165.
70. Chang L. The association of functional gastrointestinal disorders and fibromyalgia. *The European Journal of Surgery Supplement:= Acta chirurgica Supplement*. 1997(583):32-36.
71. Vandenberghe J, Vos R, Persoons P, Demyttenaere K, Janssens J, Tack J. Dyspeptic patients with visceral hypersensitivity: sensitisation of pain specific or multimodal pathways? *Gut*. 2005;54(7):914-19.