Original article

Prevalence and severity of dyspepsia in Saudi Arabia: A survey-based study

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ABSTRACT

Background and aim: Dyspepsia is one of the gastrointestinal diseases that is very common worldwide. Despite its prevalence globally, which ranges between 1.8% and 57%, no study has assessed the prevalence in Saudi Arabia. This study was aimed to investigate the prevalence and severity of dyspepsia in the general population of Saudi Arabia.

Methods: A modified Short-Form Leeds Dyspepsia Questionnaire (SF-LDQ) was utilized to conduct our study. The questionnaire score ranges between 0 and 32, where zero indicated no dyspepsia, a score of 1–8 indicated mild dyspepsia, a score of 9–15 indicated moderate dyspepsia and a score of higher than 15 represented severe dyspepsia. Socio-demographic data of the participants including age, gender, marital status, BMI, job description, insurance, and education level were collected. Using Statistical Package for Social Sciences version 21.0 (SPSS), a univariate analysis was performed to assess the association of participants characteristics with the prevalence of dyspepsia, whereas logistic regression analysis was used to correlate their characteristics with the severity of dyspepsia.

Results: During a period of one month, March 1st to 31st 2019, a total of 778 participants have completed the survey. Most of them were females accounting for 68% of the population, married (63.9%), middle aged (range 34–51 years old) and literate with high school education (72.3%). Ninety two percent (92%) of the study population were found to experience dyspepsia. However, there is no significant association between socio-demographic characteristics and dyspepsia or its severity as well.

Conclusion: The prevalence of dyspepsia in Saudi Arabia is the highest in the gulf region which would potentially lead to more GI complications, and associate to poor health and economic outcomes. Education programs are essential to raise the people awareness of dyspepsia and the appropriate ways to prevent it.

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1. Introduction

Dyspepsia is one of the most common gastrointestinal (GI) problems that people experience at some point in their lives. While dyspepsia and heartburn originate in the upper GI tract, dyspepsia can arise from the gastroduodenal region and manifest in epigastric pain or burning, discomfort, bloating, postprandial fullness and early satiety (Aziz et al., 2015; Eusebi et al., 2018), whereas heartburn manifests as a retrosternal burning sensation (Hachem and Shaheen, 2016). Dyspepsia and heartburn-associated diseases, such as gastroesophageal reflux disease (GERD), are considered distinct entities. However, there is a significant overlap between them and they can coexist in some individuals, which complicates the exact diagnosis in this group of patients (Koduru et al., 2018).

When dyspepsia diagnosis is confirmed, patient would have either organic or functional dyspepsia (FD). Although the etiology of the former is well-defined, the root cause of the later remains unknown (Harmon and Peura, 2010). FD is further subdivided into either post-prandial distress syndrome (PDS), in which dyspeptic

symptoms particularly early satiety and fullness occur post prandially for ≥3 days per week, or epigastric pain syndrome (EPS), during which dyspeptic epigastric pain or burning occurs between meals for ≥1 day per week (Aziz et al., 2015; Koduru et al., 2018). Although it is considered non-fatal, dyspepsia has a significant impact on daily activities beside its unfavorable economic consequences on individuals, societies and countries (Koduru et al., 2018; Moayyedi and Mason, 2002).

As a global problem, the prevalence of dyspepsia was analyzed by a meta-analysis, in which one-hundred studies were included, and estimated to range globally from 1.8% to 57% with an overall average of 20.8% (Ford et al., 2015). This wide range is multifactorial and attributed, but not limited to the used clinical definition and diagnosis, incidence of Helicobacter pylori (*H. pylori*) infection, lifestyle, non-steroidal anti-inflammatory drug (NSAIDs) usage, environmental factors and other factors that are mainly determined by the region of analyzed studies. Interestingly, most of the meta-analysis-included studies were conducted in the Western and South Asian countries, whereas a few (only 7 studies) were published from three Middle Eastern countries. However, none of them was Saudi Arabia [summarized in (Ford et al., 2015)]. More importantly, the prevalence of dyspepsia among some of the Middle Eastern countries varies substantially as it was shown to reach 60.1% in Jordan (Farsakh et al., 2000), 44% in UAE (Jaber et al., 2016), 30% in Iran (Khademolhosseini et al., 2010) and 29% in Turkey (Kitapçioğlu et al., 2007). Furthermore, dyspepsia's prevalence in the West, in particular the United States and the United Kingdom, was shown to reach 32% and 41%, respectively (Shaib and El-Serag, 2004; Jones et al., 1990). Collectively, data provided by the dyspepsia-related studies conducted in the Middle East and included in the meta-analysis do not truly reflect the prevalence of dyspepsia in the Middle East region, in particular Saudi Arabia, and there is a substantial difference in the prevalence between the Eastern and Western world. To further complicate this, the prevalence of GERD in Saudi Arabia was reported to reach approximately 62% (Alsulobi et al., 2017), which is higher than what has been reported on the Western and East Asian countries (up to 28% and 8%, respectively) (El-Serag et al., 2014), emphasizing on the difference in prevalence rates of GI problems between the East and West.

While dyspepsia has a well-defined negative impact on quality of life and economy, there is a paucity of research on its prevalence in Saudi Arabia. Thus, this work was aimed to estimate the prevalence of dyspepsia and its severity among Saudi population.

2. Methods

A survey-based study was conducted for a period of one month, March 2019. This study took place in the capital of Saudi Arabia, Riyadh city. The target population, aged ≥18 years, were invited to participate in this study by advertising using social media (e.g. twitter, WhatsApp.) According to the previous prevalence rate of GERD or heartburn (since dyspepsia prevalence in Saudi Arabia is unknown) of 28.7% (Alsuwat et al., 2018), the sample size (N) was calculated using the following formula: $N = z^2 \times p \times q / d^2$ (Arora et al., 2019; Alharbi and Ghoraba, 2019; Alrashed et al., 2019); Where: N is the minimum sample size, z is the level of confidence according the normal standard distribution which corresponds to the 95% confidence interval (z = 1.96), p is the prevalence of GERD (0.287), q = (1-p), and d is the desired degree of accuracy or tolerated margin of error which is 5% (0.05).

$$N = (1.96)^2 \times 0.29 \times (1-0.29) / (0.05)^2 = 314; N = 314 \text{ people}$$

The survey was obtained, modified from a previous study (Fraser et al., 2007) and validated by the authors of this study to gather data. The survey includes two sections; the first section comprises of sociodemographic information such as age, gender, marital status, level of education, job, type of insurance, and individuals whether or not exercising; the second section was the Short-Form Leeds Dyspepsia Questionnaire (SF-LDQ), which comprises of 8 questions to assess dyspepsia symptoms and its severity features including history, treatment and patient satisfaction. The SF-LDQ, adopted from the original survey the Leeds Dyspepsia Questionnaire (Moayyedi et al., 1998), has a score ranges from 0 to 32 with higher scores correlating with expanding seriousness of dyspepsia. SF-LDQ scores were interpreted as following: a score of zero indicated no dyspepsia, a score of 1–8 indicated mild dyspepsia, a score of 9–15 indicated moderate dyspepsia and a score higher than 15 represented severe dyspepsia. The SF-LDQ has been utilized previously (Bitwayiki et al., 2015) and have been approved as an appropriate and reliable instrument to evaluate the incidence and seriousness of dyspepsia (Fraser et al., 2007; Gatta et al., 2010; Nkurunziza et al., 2016).

Finally, a pilot study was conducted on thirteen individuals to test the reliability of the questionnaire and was determined to be 0.83 using Cronbach's alpha.

3. Statistical analysis

In this study, we used univariate analysis to identify the association between socio-demographic variables and dyspepsia and ordinal logistic regression to find any association between participants characteristics and dyspepsia severity. The p-value of <0.05 indicated statistically significant results.

4. Results

The questionnaire was filled by 778 individuals with a female predominance shown by 68% of the population. Most of the respondents were married (63.9%), middle aged (range 34–51 years old) and literate with high school education (72.3%). Overweight subjects were slightly higher than others (36.2%). Interestingly, more than half of the participants were students, unemployed people or businessmen, which must be taken in consideration when interpreting the results. Further details on demographic data are provided in Table 1.

Based on its comprehensive definition, the prevalence of dyspepsia in our population was 92.4% (719 out of 778), represented by Fig. 1. Of these 719 respondents, 320 (41.1%), 215 (27.6%) and 184 (23.7%) had mild, moderate and severe dyspepsia, respectively, depicted in Fig. 2. Our results showed a higher but non-significant increase in dyspepsia among males (94.4%) vs. females (91.5%) as demonstrated in Table 2. Furthermore, despite the absence of significance in severity of dyspepsia between genders, more males tended to experience mild dyspepsia symptoms compared to females, whom higher moderate and severe dyspepsia rates were noticed, shown in Table 3 & Fig. 3. Based on the marital status, the absence of significant difference between single and married individuals was observed as well in spite of the higher proportion of single subjects complaining of dyspepsia compared to the married group, shown in Table 2. Nevertheless, it is worth to mention that the rate of severe dyspepsia was elevated in the married vs. single group, demonstrated in Table 3 & Fig. 3. With respect of age, the prevalence of dyspepsia was comparable among all groups, shown in Table 2. Even though were non-significant, the majority in all age groups experienced mild dyspeptic symptoms, demonstrated in Table 3 & Fig. 3. Education levels appeared not to have any significant impact on the severity of dyspepsia despite the highest rate of severe dyspepsia among the non-educated individuals, shown in Table 3 & Fig. 3. Overweight and obesity were

Table 1
Baseline characteristics and distribution of the enrolled participants (n = 778).

Variables	N	%
Gender		
Male	248	31.9
Female	530	68.1
Marital status		
Single	281	36.1
Married	497	63.9
Age (years)		
18–24	197	25.3
25–33	133	17.1
34–51	346	44.5
52–64	96	12.3
>64	6	0.8
Job description		
Student	186	23.9
Unemployed	381	49.0
Employer	119	15.3
Retired	81	10.4
Businessman	11	1.4
Education level		
None	10	1.3
Primary/intermediate school	111	14.3
High school	566	72.3
University	91	11.7
Insurance		
Non	279	35.9
Governmental hospital	289	37.1
Private	210	27.0
BMI*		
Underweight	30	3.9
Normal weight	228	29.3
Overweight	282	36.2
Obese	227	29.2

Note: * Missing data for some participants in this category.
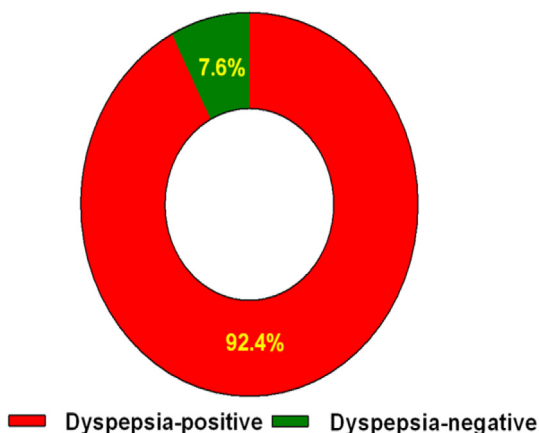

Fig. 1. The prevalence of Dyspepsia in Saudi Arabia (n = 778).

associated with an increased but non-significant risk of dyspepsia, shown in Table 2. Although comparable results between different BMI groups were observed, severe dyspepsia tended to be more prevalent among obese individuals compared to others, shown in Table 3 & Fig. 3. Overall, this study found that no significant association between demographic variables and dyspepsia severity (p > 0.05).
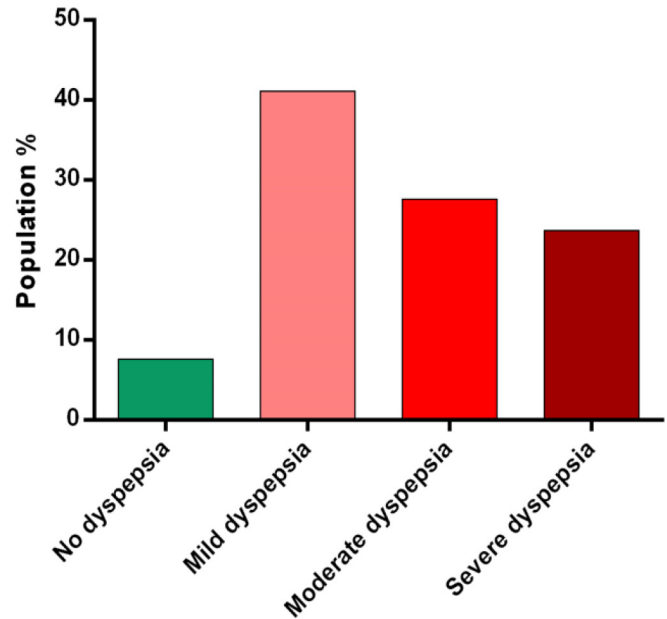
Fig. 2. Classification of participants according to the severity of dyspepsia in Saudi Arabia (n = 778).

5. Discussion

Dyspepsia is a clinical term that encompasses multiple symptoms including but not limited to indigestion, nausea, heartburn and regurgitation (Fraser et al., 2007). These symptoms may present with different diseases, thus making diagnosis of dyspepsia quite challenging (Koduru et al., 2018). The prevalence rates of dyspepsia vary globally due to multiple reasons, which were reviewed and summarized recently in Ford AC and colleagues' meta-analysis (Ford et al., 2015). According to their study, pooled prevalence of dyspepsia was the lowest in central America (7%; 5–10; P value N/A) while the highest in south America (37.7%; 28.5–47.3; P value < 0.001). The prevalence in the Middle East was also estimated to range significantly from 8.3 to 23.8%. Despite that, all the utilized studies performed in the Middle East were published from Iran, Turkey and Israel, while none originated from Saudi Arabia. Thus, the estimated range has to be carefully interpreted, as it cannot be broadly generalized to all countries in this region, including Saudi Arabia.

In our population, the prevalence of dyspepsia was very high, approximately 92%, whereas reported to reach 60.1% in Jordan (Farsakh et al., 2000). Intriguingly, the prevalence across the Gulf-neighboring Arabian countries has not been characterized except in UAE that was reported by Jaber N et al to be 44% (Jaber et al., 2016). Overall, this variation is expected and can be attributed to difference in the used definition and risk factors of dyspepsia, among which lifestyle (including tobacco smoking ... etc) and analgesics consumption are critical players.

Several studies have noted female's preponderance with dyspepsia (Ford et al., 2015; Mahadeva and Goh, 2002). On the other hand, our study showed that males are potentially, more likely to experience dyspepsia compared to females, which is on agreement with the study conducted in UAE (Jaber et al., 2016). Interestingly, Kawamura A and colleagues have shown that in Japanese population, the prevalence of dyspepsia in males was higher than females and that was attributed to the significant increase in the rate of *H.*

Table 2
Correlation of dyspepsia with socio-demographic characteristics of the participants estimated by univariate analysis (n = 778).

Variables		Dyspepsia N (%)		OR	P value
		No	Yes		
Gender	Male	14(5.6)	234(94.4)	0.78	0.454
	Female	45(8.5)	485(91.5)		
Marital status	Single	12(4.3)	269(95.7)	0.69	0.387
	Married	47(9.5)	450(90.5)		
Age groups	18–24	7(3.6)	190(96.4)	0.7	0.067
	25–33	8(6)	125(94)		
	34–51	32(9.2)	314(90.8)		
	52–64	12(20.3)	84(87.5)		
	>65	0(0)	6 (100)		
Education level	none	0(0)	10(100)	0.53	0.211
	Primary /intermediate school	10(9)	101(91)		
	High school	44(7.8)	522(92.2)		
	University	5(5.5)	86(94.5)		
BMI*	Underweight	3(10)	27(90)	1	0.895
	Normal weight	20(8.8)	208(91.2)		
	Overweight	23(8.2)	259(91.8)		
	Obesity	13(5.7)	214(94.3)		

Note: * Missing data for some participants in this category.

Table 3
Correlation of dyspepsia with socio-demographic characteristics of the participants estimated by univariate analysis (n = 778).

Variables		No dyspepsia (%)	Mild dyspepsia (%)	Moderate dyspepsia (%)	Severe dyspepsia (%)	P value
Gender	Male	14(5.6)	112(45.2)	66(26.6)	56(22.6)	0.966
	Female	45(8.5)	208(39.2)	149(28.1)	128(24.2)	
Marital status	Single	12(4.3)	131(46.6)	83(29.5)	55(19.6)	0.180
	Married	47(9.5)	189(38)	132(26.6)	129(26)	
Age groups	18–24	7(3.6)	98(49.7)	67(34)	25(12.7)	0.628
	25–33	8(6)	55(41.4)	35(26.3)	35(26.3)	
	34–51	32(9.2)	126(36.4)	94(27.2)	94(27.2)	
	52–64	12(12.5)	38(39.6)	18(18.8)	28(29.2)	
	>65	0(0)	3(50)	1(16.7)	2(33.3)	
Education level	none	0(0)	4(40)	2(20)	4(40)	0.748
	Primary /secondary school	10(9)	42(37.8)	21(18.9)	38(34.2)	
	High school	44(7.8)	238(42)	162(28.6)	122(21.6)	
	University	5(5.5)	36(39.6)	30(33)	20(22)	
BMI*	Under weight	3(10)	12(40)	11(36.7)	4(13.3)	0.653
	Normal weight	20(8.8)	99(43.4)	64(28.1)	45(19.7)	
	Overweight	23(8.2)	123(43.6)	73(25.90)	63(22.30)	
	Obesity	13(5.7)	81(35.7)	64(28.2)	69(30.4)	

Note: * Missing data for some participants in this category.
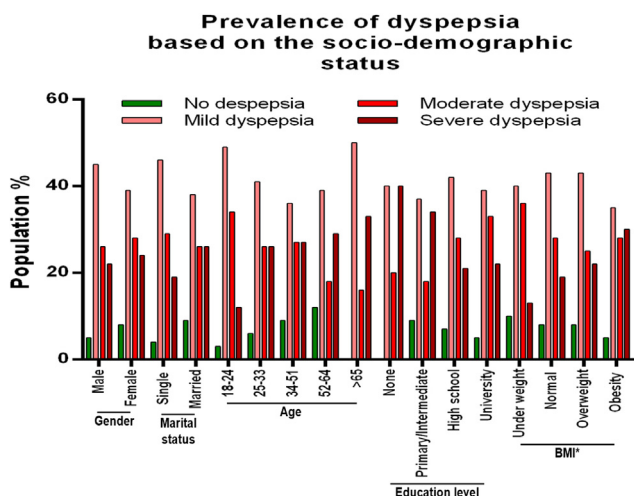

Fig. 3. Dyspepsia severity and its prevalence according to the socio-demographic status of participant.

pylori infection in males vs. females, in particular at group aged 40 to ≤50 years (Kawamura et al., 2001). More importantly, the risk of *H. pylori* infection in Saudi population was reported to be higher in males compared females (Khan, 1998). In addition, recent studies have shown significantly higher smoking habit and analgesics (including NSAIDs) utilization among Saudi males than females (BinDhim et al., 2018; Qahl et al., 2020). Nevertheless, the impact of gender on dyspepsia prevalence and the reason underlying this correlation remains controversial and further studies are necessary to unveil it (Zamani et al., 2018).

While increasing age in Europe was associated with a reduced prevalence of dyspepsia (Jones et al., 1990; Kay and Jørgensen, 1994), higher rate of dyspepsia was among people >40 years in Mumbia, India (Shah et al., 2001). In spite of that, the majority of the published studies showed that dyspepsia doesn't appear to be correlated to any age, which goes hand on hand with our findings.

Higher education was shown to be protective against dyspepsia in Rwandan healthcare workers study (Bitwayiki et al., 2015). Although the same survey was utilized in this study, such a significant association was not found, despite the tendency of lower rate

of severe dyspepsia among high schoolers and university graduates, which is supported by another study conducted on Swedish adults (Aro et al., 2011).

Almadi MA et al showed that increased BMI was associated with GERD but was not significant (Almadi et al., 2014). Although dyspepsia tended to be higher among obese participants in our study, it was not significant as well.

The reliability and validity of modified SF-LDQ in determining severity of dyspepsia was reported previously (Fraser et al., 2007; Gatta et al., 2010; Nkurunziza et al., 2016). Nonetheless, when dyspepsia data from our study were stratified based on the severity, no significant association with socio-demographic data was observed.

Our study has some potential limitations. First, it is based on the SF-LDQ that has not been validated or previously used to estimate the prevalence of dyspepsia in the Middle East and, in particular, Saudi Arabia. Despite that, we have confirmed the reliability of the questionnaire where Cronbach's alpha was 0.83. Second, the questionnaire does not differentiate between the uninvestigated and investigated (functional and organic) dyspepsia. Although this is true, we believe that its use has strengthened our study as it could capture both types, which what we intended, to some extent, to investigate. Third, we did not assess the presence of *H. pylori* in our study since it was not included in the SF-LDQ. Although debated whether it is one of the underlying causes or not (Talley, 2016), it was reported that higher prevalence of *H. pylori* among dyspeptic patients compared to the control individuals (Selgrad et al., 2008). More importantly, two recent studies conducted by Akeel M et al and Alhussaini MS showed that the prevalence rate of *H. pylori* among Saudi patients with dyspepsia is approximately 47% and 70%, respectively (Akeel et al., 2018; Alhussaini, 2017). In other words, this implies that *H. pylori* infection may have contributed to the elevated dyspeptic rate among males in our study. Fourth, smoking and NSAIDs usage were not assessed in our population, which could probably results in higher prevalence of dyspepsia among males, as well (BinDhim et al., 2018; Qahl et al., 2020). Fifth, GERD and dyspepsia still overlap and couldn't be differentiated with the use of the SF-LDQ. This clearly represents one of the major inherent drawbacks that, although would potentially influence our findings, couldn't be overcome. Sixth, we didn't seek to study the prevalence of dyspepsia in any particular region of Saudi Arabi. However, it is worth to mention that GERD prevalence in Saudi Arabia was reported to differ according to the regions and target population, ranging from approximately 24–62% (Alsulobi et al., 2017; Alrashed et al., 2019; Almadi et al., 2014; Atta et al., 2019; Altwigry et al., 2017). Beside the web-based nature of the survey, having participants from different regions would have probably impacted our findings.

Despite the previous potential limitations, our study had several strengths. First, this is the 1st study to estimate the prevalence and severity of dyspepsia in Saudi Arabia. Second, our study is the first to utilize SF-LDQ to estimate dyspepsia in the Middle East. Third is the large participants size, which is twice the required number. Overall, our findings will provide more insight to others when investigating dyspepsia prevalence in the Middle East using SF-LDQ as well as other questionnaires.

6. Conclusion

Despite the lack of significant results, our study highlights the increasing trend of dyspepsia among Saudi population living in the capital of Saudi Arabia, Riyadh city. More importantly, the prevalence was the highest in the gulf region, which would potentially precipitate higher negative consequences. Therefore, we should advocate education programs that demonstrate to public how to prevent dyspepsia in order to avoid its complications, health-wise and economically. Although SF-LDQ was utilized to assess severity of dyspepsia, there were no significant changes, even though mild dyspepsia tended to be the highest and severe dyspepsia to be the lowest in our population, which could be related to the baseline characteristics of our participants.

Authors' contributions

Conception and design: AW, SA and SB; Data production, analysis, and interpretation: AW, SA, SB, SW, ZA, AH, MA; Writing the manuscript: AW. All authors reviewed the manuscript.

References

Aziz, Q., Imthon, A., Moeller, M., Drewes, A., Juel, J., 2015. Functional gastroduodenal disorders. Hamdan Med. J. 8 (3), 253.

Eusebi, L.H., Ratnakumaran, R., Bazzoli, F., Ford, A.C., 2018. Prevalence of dyspepsia in individuals with gastroesophageal reflux-type symptoms in the community: a systematic review and meta-analysis. Clin. Gastroenterol. Hepatol. 16 (1), 39–48 e1.

Hachem, C., Shaheen, N.J., 2016. Diagnosis and management of functional heartburn. Am. J. Gastroenterol. 111 (1), 53–61. quiz 2.

Koduru, P., Irani, M., Quigley, E.M.M., 2018. Definition, pathogenesis, and management of that cursed dyspepsia. Clin. Gastroenterol. Hepatol. 16 (4), 467–479.

Harmon, R.C., Peura, D.A., 2010. Evaluation and management of dyspepsia. Therap. Adv. Gastroenterol. 3 (2), 87–98.

Moayyedi, P., Mason, J., 2002. Clinical and economic consequences of dyspepsia in the community. Gut 50 (Supplement 4), iv10–iv12.

Ford, A.C., Marwaha, A., Sood, R., Moayyedi, P., 2015. Global prevalence of, and risk factors for, uninvestigated dyspepsia: a meta-analysis. Gut 64 (7), 1049–1057.

Farsakh, N.A., Saadeh, A., Rawshdeh, M., Farsakh, H.A., 2000. Dyspepsia in the general population in Jordan. Indian J. Gastroenterol. 12, 68–70.

Jaber, N., Oudah, M., Kowatli, A., Jibril, J., Baig, I., Mathew, E., et al., 2016. Dietary and lifestyle factors associated with dyspepsia among pre-clinical medical students in Ajman, United Arab Emirates. Cent. Asian J. Glob. Health 5 (1), 192.

Khademolhosseini, F., Mehrabani, D., Zare, N., Salehi, M., Heydari, S.T., Beheshti, M., et al., 2010. Prevalence of dyspepsia and its correlation with demographic factors and lifestyle in Shiraz, Southern Iran. Middle East J. Dig Dis. 2, 24–30.

Kitapçioğlu, G., Mandiracioğlu, A., Caymaz Bor, C., Bor, S., 2007. Overlap of symptoms of dyspepsia and gastroesophageal refux in the community. Turk. J. Gastroenterol. 18 (1), 14–19.

Shaib, Y., El-Serag, H.B., 2004. The prevalence and risk factors of functional dyspepsia in a multiethnic population in the United States. Am. J. Gastroenterol. 99 (11), 2210–2216.

Jones, R.H., Lydeard, S.E., Hobbs, F.D., Kenkre, J.E., Williams, E.I., Jones, S.J., et al., 1990. Dyspepsia in England and Scotland. Gut. 31 (4), 401–405.

Alsulobi, A.M., El-Fetoh, N.M.A., Alenezi, S.G.E., Alanazi, R.A., Alenazy, R.H.S., Alenzy, F.A.L., et al., 2017. Gastroesophageal reflux disease among population of Arar City, Northern Saudi Arabia. Electron Phys. 9 (10), 5499–5505.

El-Serag, H.B., Sweet, S., Winchester, C.C., Dent, J., 2014. Update on the epidemiology of gastro-oesophageal reflux disease: a systematic review. Gut. 63 (6), 871–880.

Alsuwat, O.B., Alzahrani, A.A., Alzhrani, M.A., Alkhathami, A.M., Mahfouz, M.E.M., 2018. Prevalence of gastroesophageal reflux disease in Saudi Arabia. J. Clin. Med. Res. 10 (3), 221–225.

Arora, A., Saini, S.K., Nautiyal, V., Verma, S.K., Gupta, M., Kalra, B.P., et al., 2019. Cancer pain, anxiety, and depression in admitted patients at a tertiary care hospital: A prospective observational study. Indian J. Palliat. Care 25 (4), 562–566.

Alharbi, R.H., Ghoraba, M., 2019. Prevalence and patient characteristics of helicobacter pylori among adult in primary health care of security forces Hospital Riyadh, Saudi Arabia, 2018. J. Family Med. Prim. Care 8 (7), 2202–2206.

Alrashed, A.A., Aljammaz, K.I., Pathan, A., Mandili, A.A., Almatrafi, S.A., Almotire, M. H., et al., 2019. Prevalence and risk factors of gastroesophageal reflux disease

among Shaqra University students, Saudi Arabia. J. Family Med. Prim. Care 8 (2), 462–467.

Fraser, A., Delaney, B.C., Ford, A.C., Qume, M., Moayyedi, P., 2007. The Short-Form Leeds Dyspepsia Questionnaire validation study. Aliment Pharmacol. Ther. 25 (4), 477–486.

Moayyedi, P., Duffett, S., Braunholtz, D., Mason, S., Richards, I.D., Dowell, A.C., et al., 1998. The Leeds Dyspepsia Questionnaire: a valid tool for measuring thepresence and severity of dyspepsia. Alimentary Pharmacol. Therap. 12 (12), 1257–1262.

Bitwayiki, R., Orikiiriza, J.T., Kateera, F., Bihizimana, P., Karenzi, B., Kyamanywa, P., et al., 2015. Dyspepsia prevalence and impact on quality of life among Rwandan healthcare workers: A cross-sectional survey. S Afr. Med. J. 105 (12), 1064–1069.

Gatta, L., Moayyedi, P., Tosetti, C., Vakil, N., Ubaldi, E., Barsanti, P., et al., 2010. A validation study of the Italian Short-Form Leeds Dyspepsia Questionnaire. Intern. Emerg. Med. 5 (6), 501–506.

Nkurunziza, A., Dusabejambo, V., Everhart, K., Bensen, S., Walker, T., 2016. Validation of the Kinyarwanda-version Short-Form Leeds Dyspepsia Questionnaire and Short-Form Nepean Dyspepsia Index to assess dyspepsia prevalence and quality-of-life impact in Rwanda. BMJ Open. 6, (6) e011018.

Mahadeva, S., Goh, K.L., 2002. Epidemiology of functional dyspepsia- a global perspective. World J. Gastroenterol. 12 (17), 2661–2666.

Kawamura, A., Adachi, A., Takashima, T., Murao, M., Katsube, T., Yuki, M., et al., 2001. Prevalence of functional dyspepsia and its relationship with helicobacter pylori infection in a Japanese Population.pdf. J. Gastroenterol. Hepatol. 16 (4), 384–388.

Khan, A.R., 1998. An age- and gender-specific analysis of H. Pylori Infection. Ann. Saudi Med. 18 (1), 6–8.

BinDhim, N., Alqahtani, A., Althumiri, N., Almubark, R., Algabbani, A.M., 2018. The prevalence of cigarette smoking in Saudi Arabia in 2018. Food Drug Regulat. Sci. J. 1 (1), 1.

Qahl, A., Albedaiwi, Y., Faqihi, A., Arishi, N., Zarban, Y., Hakeem, F., 2020. Knowledge and attitude of analgesics usage among the Saudi population. Int. J. Med. Dev. Countries, 318–324.

Zamani, M., Ebrahimtabar, F., Zamani, V., Miller, W.H., Alizadeh-Navaei, R., Shokri-Shirvani, J., et al., 2018. Systematic review with meta-analysis: the worldwide prevalence of Helicobacter pylori infection. Aliment Pharmacol. Ther. 47 (7), 868–876.

Kay, L., Jørgensen, T., 1994. Epidemiology of upper dyspepsia in a random population. Prevalence, incidence, natural history, and risk factors. Scand. J. Gastroenterol. 29 (1), 2–6.

Shah, S.S., Bhatia, S.J., Mistry, F.P., 2001. Epidemiology of dyspepsia in the general population in Mumbai. Indian J. Gastroenterol. 20 (3), 103–106.

Aro, P., Talley, N.J., Agreus, L., Johansson, S.E., Bolling-Sternevald, E., Storskrubb, T., et al., 2011. Functional dyspepsia impairs quality of life in the adult population. Aliment Pharmacol. Ther. 33 (11), 1215–1224.

Almadi, M.A., Almousa, M.A., Althwainy, A.F., Altamimi, A.M., Alamoudi, H.O., Alshamrani, H.S., et al., 2014. Prevalence of symptoms of gastroesopahgeal reflux in a cohort of Saudi Arabians: a study of 1265 subjects. Saudi J. Gastroenterol. 20 (4), 248–254.

Talley, N.J., 2016. Functional dyspepsia: new insights into pathogenesis and therapy. Korean J. Intern. Med. 31 (3), 444–456.

Selgrad, M., Kandulski, A., Malfertheiner, P., 2008. Dyspepsia and helicobacter pylori. Dig Dis. 26 (3), 210–214.

Akeel, M., Elmakki, E., Shehata, A., Elhafey, A., Aboshouk, T., Ageely, H., et al., 2018. Prevalence and factors associated with H. pylori infection in Saudi patients with dyspepsia. Electron Phys. 10 (9), 7279–7286.

Alhussaini, M.S., 2017. Prevalence of Helicobacter pyloriamong patients with different gastrointestinal disorders in Saudi Arabia. Med. J. Indonesia 25 (4), 214–220.

Atta, M.M., Sayed, M.H., Zayed, M.A., Alsulami, S.A., Al-Maghrabi, A.T., Kelantan, A.Y., 2019. Gastro-oesophageal reflux disease symptoms and associated risk factors among medical students, Saudi Arabia. Int. J. Gen. Med. 12, 293–298.

Altwigry, A.M., Almutairi, M.S., Ahmed, M., 2017. Gastroesophageal reflux disease prevalence among school teachers of Saudi Arabia and its impact on their daily life activities. Int. J. Health Sci. (Qassim) 11 (2), 59–64.