Iranian lifestyle factors affecting reflux disease among healthy people in Qom

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Abstract

Background and aim: Gastroesophageal reflux disease (GERD) is one of the most common digestive system disorders. Life style factors may increase the risk of reflux disease. We aimed to determine prevalence of reflux and related life style-factors in the population living in Qom.

Methods: This cross-sectional study was conducted among 1500 residents of Qom in 2014. Individuals were selected through multi-stage sampling. They completed two questionnaires: FSSG questionnaire for diagnosis of GERD and a general questionnaire to measure demographic and lifestyle factors. Univariate and multivariate were used for analysis of data. Data were analyzed using IBM SPSS version 20.

Results: A total of 1130 individuals were analyzed in which 52.4% of them were female. Prevalence of GERD was 28%. Adjusted findings showed use of PPIs (OR: 2.2, 95% CI: 2-5), taking H2RAs (OR: 4.7, 95% CI: 2.3-9.4), the habit of quick eating (OR: 1.5, 95% CI: 1.1-2), extra salt consumption on daily meals (OR: 1.5, 95% CI: 1.05-2), lack of sleep (OR: 2.6, 95% CI: 1.5-4.8), and consumption of white bread (OR: 1.7, 95% CI: 1.05-2.7) were related to increased risk of GERD.

Conclusion: Our findings showed lifestyle factors such as habit of quick eating, extra salt on regular meals, lack of sleep and use of white bread were associate with increased risk of GERD. However, habit of midnight snack, having dinner just before bedtime, lack of breakfast, smoking, drinking tea and coffee were not associated with increased risk of GERD. It is recommended to carry out a cohort study among the Iranian population to evaluate the effect of life-style risk factors on GERD.

Keywords: Gastroesophageal reflux disease, Frequency scale, Life-style factors, Risk factor

1. Introduction

Gastroesophageal reflux disease (GERD) is a public health problem which defines when the reflux of gastric contents causes troublesome symptoms of heartburn or regurgitation. GERD symptoms represent one of the most frequent health problems in the Western world (1). Trend in the prevalence of GERD is increasing worldwide, but seems to be higher in the West than in the East (2, 3). Population-based studies have shown that the prevalence of GERD is higher in Central (7.6-19.4%) and West Asia (12.5-27.6%) (1, 4). In Iran, the study which was carried out in Tabriz, North-west of Iran, estimated that the prevalence of GERD is 2.7% (5). Another population-based study in
the capital city of Tehran, reported a prevalence of 18.2% (6). Also, in Isfahan, the prevalence of GERD, defined as
the presence of heartburn sometimes, was often or always reported as 23.5% in the study population of 4,763 adults
(7). Despite the high prevalence of GERD symptoms, however, its etiology is still not completely understood. There
are hypotheses that the genetic factor, the Helicobacter pylori prevalence and the change in life-style, dietary factors
might have an influence. However, recommended modification in lifestyle and dietary factor is under debate (1).
Regarding nutrition, a number of patients and physicians associate the occurrence of reflux symptoms with various
dietary factors. As a consequence, patients are often advised to avoid fatty meals, candy, coffee, or tea. However,
tests remain inconclusive on the effects of these dietary components on heartburn or regurgitation. There is also
certainty regarding the role of alcohol and smoking in causing reflux symptoms (8). Several studies have shown
an increased risk of GERD symptoms to be associated with obesity, consumption, dinner just before bedtime, a high
dietary fat intake, smoking, intake of non-steroidal anti-inflammatory drugs and sleeping position. Furthermore,
several studies provided evidence that gender, age, marital status, socioeconomic status, level of education, family
history, and asthma as potential risk factors of GERD (9). Few studies have addressed these issues and the available
results are partly conflicting; thus, more research is required until any preventive and accelerator effect of lifestyle
on GERD can be better established. In this large population-based survey, we aimed to assess the prevalence of
GERD in Qom city (a multicultural city) in Iran (a country which has experienced main dietary changes over the
past decades), and to determine the impact of socioeconomic and lifestyle factors on GERD symptoms.

2. Material and Methods
This cross-sectional study was carried out on 1,500 residents of Qom in 2014. Individuals were selected through
multi-stage sampling - the city was divided into 8 strata, then each stratum was classified into clusters. Finally,
several clusters were selected randomly, at each stratum. Each individual over 18 years old, without gastrectomy
was included in the study. All incomplete questionnaires on life-style and FSSG were excluded. Therefore, 1,130
individuals’ data were analyzed. A self-administered questionnaire was used to collect the data. The questionnaire
had two parts: the first part included background characteristics such as age, gender, BMI, education level, income
tier, main meal, snacks, late meal, breakfast behavior, vegetable and fruit
consumption, oven-cooked meals, taking white bread, red meats, salty meals, tea/coffee consumption, alcohol,
carbonized drinks, and regular physical activities. The second part of the questionnaire was “Frequency Scale for
the Symptoms of GERD (FSSG)” to evaluate reflux symptoms. It consists of 12 questions to which patients who most
often answered "yes" were selected and were assigned scores (never =0; occasionally =1; sometimes =2; often =3;
and always =4) to produce a frequency scale for symptoms of GERD (FSSG). The validity of FSSG in comparison
with QUEST is acceptable (10, 11). To be diagnosed as GERD, the cutoff point of FSSG has been determined as
greater than 10 (12). The FSSG scale was translated to a Farsi version by forward-backward method. Then, its
content validity was assessed and confirmed by CVI and CVR. The internal consistency was assessed by Cronbach’s
alpha coefficient which was calculated as 0.85. Also, the reliability of FSSG was assessed by test retest method, and
Pearson correlation was calculated as 0.89. The dependent variable was binary variable and is divided into having
GERD or not. Data were analyzed using multiple logistic regression after applying a univariate model to each
background characteristic or risk factor. Crude and adjusted Odds ratios were reported at 5% significance level
accompanied with 95% confidence intervals. IBM© SPSS© Statistics version 20 (IBM© Corp., Armonk, NY, USA)
was employed for the analysis. The study was approved by the Ethics Committee of Qom University of Medical
Sciences. The study protocol was also approved by the Ethics Committee of Qom University of Medical Sciences.
An informed written consent was obtained from the patients. Also, no conflict of interest has been declared by the
authors. Proposal code was MUQ.REC.1393.135.

3. Results
The study was done on 1,130 individuals of whom 48% were male. Mean age of all participants was 39.4±10.0.
FSSG mean score was 10.5±7.7. Based on this score, prevalence of GERD was estimated as 28%. Table 1 shows the
univariate analysis results. The prevalence of GERD was not different between males and females; obese individuals
had higher prevalence of GERD than normal weight (71.1 vs. 62%); participants who took digestive medicine such as
H2Ras and PPIs were more at risk of getting GERD (OR=8.2, p<0.001) and (OR=5.7, p<0.001) respectively; and
individual with lower level of education had less risk of GERD than higher education (OR=0.7, p=0.03). Table 2
contains the univariate analysis results of life style risk factors. Among all, 11 risk factors appeared to increase risk
of GERD significantly: insufficient sleep (OR=3.8, p<0.001), drinking carbonated drinks (OR = 3, p<0.001), having
meals very fast (OR=2, p<0.001), having salty meals (OR=2, p<0.001), having snacks after main meal at night
(OR=1.8, p=0.001), cigarette smoking (OR=1.8, p=0.02), lack of breakfast (OR=1.6, p<0.001), lack of regular
physical activities (OR=1.6, p=0.01), drinking tea (OR=1.6, p=0.02), having white bread (OR=1.6, p=0.02), and eating dinner late (OR=1.4, p=0.002). There was no statistically significant relationship between drinking coffee, consuming vegetables and fruits, red meat and fried meals with risk of GERD. Finally, all significant risk factors were entered into the multiple logistic regression model (Table 3). Adjusted results showed taking H2Ras (OR=4.7, p<0.001), insufficient sleep (OR=2.6, p=0.001), taking PPIs (OR=2.2, p=0.045), consuming white bread (OR=1.7, p=0.02), eating meals very fast (OR=1.5, p=0.008), having salty meals (OR=1.5, p=0.02), and education level (OR=0.5, p=0.004) were statistically significant risk factors for GERD.

**Table 1.** Association of demographic, socioeconomic, and state of drug use with GERD (Univariate analysis)

| Factors                          | Number | Univariate |
|----------------------------------|--------|------------|
|                                  | No GERD | GERD | OR (95% CI) | p-value |
| Gender                           |         |      |             |         |
| Female                           | 193 (33.6) | 382 (66.4) | 1.1 (0.8-1.4) | 0.4 |
| Male                             | 187 (35.8) | 335 (64.2) | (reference) | (reference) |
| BMI status                       |         |      |             |         |
| Obese                            | 50 (28.9)  | 123 (71.1) | 1.5 (1.04-2.1) | 0.03 |
| Overweight                       | 125 (33)   | 245 (67)  | 1.2 (0.9-1.6) | 0.1 |
| Normal                           | 214 (38)   | 349 (62)  | (reference) | (reference) |
| Age                              |         |      |             |         |
| <High school                     | 111 (42.4) | 151 (57.6) | 0.7 (0.5-0.9) | 0.03 |
| High school                      | 121 (30.6) | 274 (69.4) | 1.1 (0.8-1.5) | 0.3 |
| University                       | 158 (34.1) | 306 (65.9) | (reference) | (reference) |
| Education level                  |         |      |             |         |
| <High school                     | 111 (42.4) | 151 (57.6) | 0.7 (0.5-0.9) | 0.03 |
| High school                      | 121 (30.6) | 274 (69.4) | 1.1 (0.8-1.5) | 0.3 |
| University                       | 158 (34.1) | 306 (65.9) | (reference) | (reference) |
| Income level                     |         |      |             |         |
| Low                              | 52 (35.6)   | 94 (64.4)  | 1.2 (0.9-1.6) | 0.2 |
| Middle                           | 281 (33.6)  | 556 (66.4) | 1.4 (1.1-2.06) | 0.044 |
| High                             | 56 (41.8)   | 78 (58.2)  | (reference) | (reference) |
| Use of PPIs                      |         |      |             |         |
| Yes                              | 10 (9.4)    | 96 (90.6)  | 5.7 (2.9-11.1) | <0.001 |
| No                               | 384 (37.5)  | 640 (62.5) | (reference) | (reference) |
| Use of H2Ras                     |         |      |             |         |
| Yes                              | 12 (7.3)    | 152 (92.7) | 8.2 (4.5-15-1) | <0.001 |
| No                               | 382 (39.5)  | 584 (60.5) | (reference) | (reference) |
| Use of NSAIDs                    |         |      |             |         |
| Yes                              | 107 (23.2)  | 354 (76.8) | 2.5 (1.9-3.2) | <0.001 |
| No                               | 286 (43.3)  | 374 (56.7) | (reference) | (reference) |
| Use of other digestive drugs     |         |      |             |         |
| Yes                              | 7 (12.7)    | 48 (87.3)  | 3.8 (1.7-8.5) | 0.001 |
| No                               | 385 (36.2)  | 678 (63.8) | (reference) | (reference) |
| Use of steroids                  |         |      |             |         |
| Yes                              | 9 (20)      | 36 (80)   | 2.1 (1.04-4.6) | 0.03 |
| No                               | 383 (35.4)  | 698 (64.6) | (reference) | (reference) |
| Use of antihypertensive          |         |      |             |         |
| Yes                              | 14 (29.8)   | 33 (70.2)  | 1.2 (0.6-2.4) | 0.4 |
| No                               | 379 (35.2)  | 699 (64.8) | (reference) | (reference) |
| Use of antihyperglycemic         |         |      |             |         |
| Yes                              | 7 (28)      | 18 (72)   | 1.3 (0.5-3.3) | 0.4 |
| No                               | 386 (35)    | 716 (65)  | (reference) | (reference) |
| History of cardiovascular disease|         |      |             |         |
| Yes                              | 9 (23.7)    | 29 (76.3)  | 1.7 (0.8-3.7) | 0.1 |
| No                               | 384 (35.3)  | 703 (64.7) | (reference) | (reference) |
| History of renal failure         |         |      |             |         |
| Yes                              | 21 (27.6)   | 55 (72.4)  | 1.4 (0.8-2.4) | 0.1 |
| No                               | 370 (35.5)  | 673 (64.5) | (reference) | (reference) |

Numbers and row percentages (in parentheses). Discrepancies in the totals are due to missing covariate values.

**Table 2.** Association of life style factor with GERD (Univariate analysis)

| Factors                        | Number | Univariate |
|--------------------------------|--------|------------|
|                                | No GERD | GERD | OR (95% CI) | p-value |
| Habit of midnight snack        |         |      |             |         |
| Yes                            | 38 (23.9) | 121 (76.1) | 1.8 (1.2-2.7) | 0.001 |
| No                             | 355 (37.1) | 603 (62.9) | (reference) | (reference) |
| Habit of quick eating          |         |      |             |         |
| Yes                            | 131 (26.3) | 367 (73.7) | 2 (1.5-2.6) | <0.001 |
| No                             | 261 (41.9) | 362 (58.1) | (reference) | (reference) |
| Dinner just before bedtime     |         |      |             |         |
| Yes                            | 172 (30.6) | 391 (69.4) | 1.4 (1.1-1.8) | 0.002 |
| No                             | 220 (39.2) | 341 (60.8) | (reference) | (reference) |
| Frequent lack of breakfast     |         |      |             |         |
| Yes                            | 107 (27.5) | 282 (72.5) | 1.6 (1.2-2.1) | <0.001 |
| No                             | 284 (38.6) | 452 (61.4) | (reference) | (reference) |
| Habit of alcohol drinking      |         |      |             |         |
| Yes                            | 23 (27.7)  | 60 (72.3)  | 1.4 (0.8-2.3) | 0.1 |
| No                             | 370 (35.5) | 672 (64.5) | (reference) | (reference) |
| Habit of smoking               |         |      |             |         |
| Current smoker                 | 19 (23.8)  | 61 (76.2)  | 1.8 (1.07-3.1) | 0.02 |
| Former smoker                  | 19 (26.4)  | 53 (73.6)  | 1.5 (0.9-2.7) | 0.09 |
| Never smoker                   | 349 (36.3) | 613 (63.7) | (reference) | (reference) |
| Tea use (Cups per day)          |         |      |             |         |
| > 3                            | 98 (30.9)  | 219 (69.1) | 1.6 (1.06-2.4) | 0.02 |
Table 3. Significant factors associated with GERD (Multivariate analysis)

| Factor                        | Multivariate | OR   | 95% CI | P-value |
|-------------------------------|--------------|------|--------|---------|
| Education level               |              |      |        |         |
| <High school                  |              | 0.5  | 0.3-0.8| 0.004   |
| High school graduation        |              | 1.1  | 0.7-1.5| 0.6     |
| University                    | Reference    |      |        |         |
| Use of PPIs                   |              | 2.2  | 1.5    | 0.045   |
| No                            | Reference    |      |        |         |
| Use of H2Ras                  |              | 4.7  | 2.3-9.4| <0.001  |
| No                            | Reference    |      |        |         |
| Use of NSAIDs                 |              | 1.6  | 1.2-2.3| 0.002   |
| No                            | Reference    |      |        |         |
| Habit of quick eating         |              | 1.5  | 1.1-2  | 0.008   |
| No                            | Reference    |      |        |         |
| Extra salt on regular meals   |              |      |        |         |
| Always                        |              | 1.2  | 0.7-2   | 0.4     |
| Sometimes                     |              | 1.5  | 1.05-2 | 0.02    |
| Never                         | Reference    |      |        |         |
| Lack of sleeping              |              |      |        |         |
| Always                        |              | 2.6  | 1.5-4.8| 0.001   |
| Sometimes                     |              | 1.6  | 1.2-2.3| 0.003   |
| Never                         | Reference    |      |        |         |
| With bread                    |              |      |        |         |
| Frequent consumption          |              | 1.7  | 1.05-2.7| 0.02   |
| Moderate consumption          |              | 1.5  | 0.9-2.6| 0.09    |
| Rare/no consumption           | Reference    |      |        |         |

4. Discussion
Our findings show that prevalence of GERD was about 28%. The most important risk factors were taking H2RAs medicine, insufficient sleep, taking PPIs medicine, consumption of white bread, eating meals very fast, taking in extra salt with food, and education level respectively. Based on our search at the time, a few studies studied the relationship between prevalence of GERD and its risk factors in Iran (5-7). In this study, the prevalence of GERD
was estimated as 28%, while previous studies reported 18.2 and 12.3% in Tehran and Gonbad-Kavous respectively (6, 13). The prevalence of GERD in Iran has been reported as much higher than the other Asian countries. However, Iran GERD prevalence can be comparable with those in the USA, Turkey, southern India, Greece and Moscow (1, 4, 14, 15). The less prevalence of GERD in Asian countries was attributed to consuming less oily foods (1, 9). The least GERD prevalence was reported for China and the most for the USA (1). This high prevalence may be explained by the fact that the population of Iran has experienced major dietary changes such as more consumption of fast food in the past decades, in line with changes in socioeconomic factors. We did not find significant relation between age and GERD like three other studies (9, 16, 17); two studies reported a positive relation, (18, 19) and two, reverse relation (20, 21). Age mean of our samples was low, because of that, we did not find significant association between age and GERD. Univariate analysis showed that obesity is a predictor of GERD, however, adjusted results did not. Yamamichi reported adjusted BMI as a predictor of GERD (2). Other studies also showed BMI as a predictor of GERD (6, 9, 22-24). HUNT2, a population based study, provided some evidence that obesity had a positive relationship with GERD (25). Furthermore, a systematic review (26) also showed a significant relationship between obesity and GERD. This difference between results may be due to our sample size being lower than previous studies. Taking H2RAs and PPIs in both unadjusted and adjusted analysis appeared to be significant predictors of GERD. This result was concordant with results of Yamamichi et.al. (2). This study evaluated the relationship between GERD and a wide range of life-style risk factors. Among them, habit of midnight snack, quick eating, having dinner very late, not having breakfast, drinking tea, taking extra salt when having dinners, carbonated drinks, insufficient sleep, and consumption of white bread appeared to be statistically significant predictors of GERD. All the above-mentioned adjusted risk factors in the Japanese study (2) were also confirmed as statistically significant predictors of GERD and concordant with our results. The most significant adjusted variables were insufficient sleep, obesity, having late dinner, and having a snack at night time respectively. We did not find any relationship between drinking coffee and GERD. Nelson et. al. (27). Nocon (23), and Nasseri et. al. did not find any relationship (6), however, Yamamichi et. al. (2) found a moderate significant relationship. In this study, there was no evidence against red meat and GERD, and in turn, fat. Nocon (23), Nasseris (6) and Çela et. al. (9), found similar results. Matsuki (28) in a NERD patient group, and El-Serag et.al. (29) reported lipid as a GERD risk factor. Consumption of extra salt at the time of having meals was reported as a significant predictor of GERD (27), however, Matsuki (28) did not provide any important evidence against it. The association between smoking and GERD was confirmed in our findings and by (6, 9, 23, 30). Different studies showed different results in different directions on the relationship between regular exercise (physical activity) and GERD (5, 27, 31-33). This study provided a pattern against lack of exercise, the higher amount of exercise, the lower risk of GERD. However, our study does have some limitations. Firstly, we could not use clinical diagnosis for GERD. The second limitation of this study is that analysis requires reliable sources of data gained from prospective cohort studies, while we carried out a cross sectional design. Third, the quality and precision of the estimations and associations primarily depend on the quality of the recorded data.

5. Conclusions
This cross-sectional study showed a high prevalence of GERD in Iran and provided evidence on the association between GERD and taking H2RAs medicine, insufficient sleep, taking PPIs medicine, consumption of white bread, eating meals very fast, and taking in extra salt with food. This study has some strong advantages including the sample size and setting of study, which can be considered as a representative of the whole of Iran as a matter of high immigration in and in turn, the results could be generalised to the country. However, this is a cross-sectional study and prone to the usual pitfalls of such studies.

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Conflict of Interest:
There is no conflict of interest to be declared.

Authors' contributions:
All authors contributed to this project and article equally. All authors read and approved the final manuscript.
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