

## ***Lifestyle Factors Affecting Gastro Esophageal Reflux Disease: A Cross-Sectional Study Among Healthy People in Qom-Iran***

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### **Abstract**

**Background:** Gastroesophageal reflux disease (GERD) is one of the most common digestive system disorders. Life style factors may increase the risk of reflux disease.

**Objectives:** We aimed to estimate prevalence of reflux and related life style factors among the population live in Qom.

**Methods:** This is a cross-sectional study conducted among 1500 residents of Qom-Iran in 2014. Individuals were selected through a multi-stage sampling. They completed two questionnaires: FSSG questionnaire for diagnosis of GERD and a general questionnaire to measure demographic and lifestyle factors.

**Results:** After data manipulation, 1130 individuals were analyzed in which 52/4% of them were female. Prevalence of GERD was 28%. The adjusted findings showed using PPIs (OR: 2.2, 95% CI: 2–5), taking H<sub>2</sub>RAs (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 sleeping (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 increase the risk of GERD.

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

**Key words:** *Gastroesophageal reflux disease, FSSG (Frequency Scale for the Symptoms of GERD), Lifestyle, Risk factor, Cross-sectional*

### **Introduction**

Gastro esophageal reflux disease (GERD) is a public health problem which defines when the reflux of gastric contents causes troublesome and symptoms of heartburn or regurgitation. The health related to quality of life, sleep and productivity were impaired in patients with

GERD and were significantly more in patients with nocturnal GERD compared to GERD patients with only daytime suffering [1].

Trend in the prevalence of GERD is increasing worldwide but seems to be higher in the West than in the East [2,3]. The 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 carried out in Tabriz, North-west of Iran, estimated that the prevalence of GERD is 2.7% [5]. Another population-based study in Tehran, capital city, reported a prevalence of 18.2% [6]. Also in Isfahan, the prevalence of GERD, sometimes defines as the presence of heartburn, it was always reported as 23.5% in the study population of 4763 adults [7]. The reasons in different prevalence of GERD worldwide is unknown, but there is a hypothesis that the genetic factor, the *Helicobacter pylori* prevalence and the change in life style, dietary factors might have an influence, too. However, recommended modification in lifestyle and dietary factor is still under debate [8].

Several studies have showed an increased risk of GERD symptoms to be associated with obesity, nutrition, alcohol consumption, having 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 are as the potential risk factors of GERD [9].

In this large population-based survey, we aimed to assess the prevalence of GERD in Qom city (the multicultural city in Iran), 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.

## Methods

This cross-sectional study was carried out on 1500 residents of Qom-Iran in 2014. Individuals were selected through a multi-stage sampling-the city was divided into 8 strata, then each stratum was classified into clusters. Finally, several clusters were randomly selected and samples based on proportion to size of each clusters were randomly selected, too. Each individual over 18 years old, without gastrectomy was included in the study. All incomplete questionnaires on life style and FSSG were excluded. Therefore, 1130 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, the level of education, the income level, history of taking digestive medicine, PPIs, H<sub>2</sub>Ras, life style factors including main meal, snacks, late meal, breakfast behavior, consuming vegetables and fruits, fried meals, taking white bread, red meat, salty meals, drinking tea and coffee, alcohol, fizzy drinks and regular physical activities.

The second part of questionnaire was “Frequency Scale for the Symptoms of GERD (FSSG)” to evaluate reflux symptoms. The validity of FSSG in comparison with QUEST is acceptable with sensitivity of 36.9% and specificity of 38.9% [10,11]. To be diagnosed as GERD, the cutoff point of FSSG has been determined as greater than 10 [12]. In order to use the questionnaire in Farsi, it was translated into Farsi by translation-back-translation method. The internal validity was assessed by Cronbach's alpha coefficient which calculated as 0.85. Data were analyzed using multiple logistic regression after applying a univariate model to each background characteristics or risk factors. Crude and adjusted Odds ratios were reported at 5% significance level accompanying with 95% confidence intervals. SPSS version 20 was employed for the analysis.

## Results

The study was done on 1130 individuals of whom 48% were male. Mean age of all participants were 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 H<sub>2</sub>Ras and PPIs were more at the risk of getting GERD (OR=8.2, 95% CI: 4.5-15, p<0.001) and (OR=5.7, 95% CI: 2.9-11.1, p<0.001) respectively; and individual with lower level of education had less risk of GERD than higher education (OR=0.7, 95% CI: 0.5-0.9, p=0.03).

**Table 1: Association of demographic, socioeconomic, and received medications use with GERD (Univariate analysis)**

| Factors                           |                              |                     | Without GERD | With GERD    | Univariate     |             |
|-----------------------------------|------------------------------|---------------------|--------------|--------------|----------------|-------------|
|                                   |                              |                     |              |              | OR (95% CI)    | P value     |
| <b>Gender</b>                     | N(%)                         | Female              | 193(33.6)    | 382(66.4)    | 1.1(0.8-1.4)   | 0.4         |
|                                   |                              | Male                | 187(35.8)    | 335(64.2)    | (reference)    | (reference) |
| <b>BMI</b>                        | N(%)                         | 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) |
| <b>Age</b>                        | mean±sd                      |                     | 39.9±10.7    | 39.1±9.6     | 0.99(0.98-1)   | 0.2         |
| <b>Educational level</b>          | N(%)                         | <High school        | 111(42.4)    | 151(57.6)    | 0.7(0.5-0.9)   | 0.03        |
|                                   |                              | High school diploma | 121(30.6)    | 274(69.4)    | 1.1(0.8-1.5)   | 0.3         |
|                                   |                              | University          | 158(34.1)    | 306(65.9)    | (reference)    | (reference) |
| <b>Income level</b>               | N(%)                         | Low                 | 52(35.6)     | 94(64.4)     | 1.2 (0.8-2.1)  | 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) |
| <b>Use of medications</b>         |                              |                     |              |              |                |             |
| <b>Digestive medications</b>      | <b>PPIS N(%)</b>             | Yes                 | 10(9.4)      | 96(90.6)     | 5.7(2.9-11.1)  | <0.001      |
|                                   |                              | No                  | 384(37.5)    | 640(62.5)    | (reference)    | (reference) |
|                                   | <b>H<sub>2</sub>Ras N(%)</b> | Yes                 | 12(7.3)      | 152(92.7)    | 8.2 (4.5-15)   | <0.001      |
|                                   |                              | No                  | 382(39.5)    | 584(60.5)    | (reference)    | (reference) |
|                                   | <b>NSAIDs N(%)</b>           | Yes                 | 107(23.2)    | 354(76.8)    | 2.5(1.9-3.2)   | <0.001      |
|                                   |                              | No                  | 286(43.3)    | 374(56.7)    | (reference)    | (reference) |
| <b>Other digestive drugs N(%)</b> | Yes                          | 7(12.7)             | 48(87.3)     | 3.8(1.7-8.5) | 0.001          |             |
|                                   | No                           | 385(36.2)           | 678(63.8)    | (reference)  | (reference)    |             |
| <b>Steroids</b>                   | N(%)                         | Yes                 | 9(20)        | 36(80)       | 2.1(1.04-4.6)  | 0.03        |
|                                   |                              | No                  | 383(35.4)    | 698(64.6)    | (reference)    | (reference) |
| <b>Antihypertensive</b>           | N(%)                         | Yes                 | 14(29.8)     | 33(70.2)     | 1.2(0.6-2.4)   | 0.4         |
|                                   |                              | No                  | 379(35.2)    | 699(64.8)    | (reference)    | (reference) |
| <b>Antihyperglycemic</b>          | N(%)                         | Yes                 | 7(28)        | 18(72)       | 1.3(0.5-3.3)   | 0.4         |
|                                   |                              | No                  | 386(35)      | 716(65)      | (reference)    | (reference) |
| <b>History of disease</b>         | <b>Cardiovascular N(%)</b>   | Yes                 | 9(23.7)      | 29(76.3)     | 1.7(0.8-3.7)   | 0.1         |
|                                   |                              | No                  | 384(35.3)    | 703(64.7)    | (reference)    | (reference) |
|                                   | <b>Renal failure N(%)</b>    | Yes                 | 21(27.6)     | 55(72.4)     | 1.4(0.8-2.4)   | 0.1         |
|                                   |                              | No                  | 370(35.5)    | 673(64.5)    | (reference)    | (reference) |

GERD: Gastro Esophageal Reflux disease; PPIS: Proton Pump Inhibitor; H<sub>2</sub>RaS: H<sub>2</sub> Receptor Agonists or H<sub>2</sub> Blockers; NSAIDs: Nonsteroidal Anti-inflammatory Drugs.

Table 2 contains the univariate analysis results of life style risk factors. Among all, 11 risk factors appear to increase risk of GERD significantly: insufficient sleep (OR=3.8, 95% CI: 2.3-6.2, p<0.001), drinking fizzy drinks (OR=3, 95% CI: 1.6-5.4, p<0.001), having meals very fast (OR=2, 95% CI: 1.5-2.6, p<0.001), having salty meals (OR=2, 95% CI: 1.3-3.1, p<0.001), having snacks after main meal at night (OR=1.8, 95% CI: 1.2-2.7, p=0.001), cigarette smoking (OR=1.8, 95%

CI: 1.07-3.1, p=0.02), lack of breakfast (OR=1.6, 95% CI: 1.2-2.1, p<0.001), lack of regular physical activities (OR=1.6, 95% CI: 1.1-2.4, p=0.01), drinking tea (OR=1.6, 95% CI: 1.06-2.4, p = 0.02), having white bread (OR= 1.6, 95% CI: 1.07-2.3, p=0.02), and eating dinner late (OR=1.4, 95% CI: 1.1-1.8, p = 0.002). There was not any statistically significant relationship between drinking coffee, consuming vegetables and fruits, red meat and fried meals with the risk of GERD.

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

| Factors                     |                      | Without GERD | With GERD  | Univariate     |             |
|-----------------------------|----------------------|--------------|------------|----------------|-------------|
|                             |                      | N (%)        | N (%)      | 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        |
|                             | 1-3                  | 230 (35.7)   | 415 (64.3) | 1.2 (0.8-1.8)  | 0.1         |
|                             | None                 | 60 (41.7)    | 84 (58.3)  | (reference)    | (reference) |
| Coffee use (Cups per day)   | > 3                  | 4 (44.4)     | 5 (55.6)   | 0.6 (0.1-2.4)  | 0.5         |
|                             | 1-3                  | 46 (38)      | 75 (62)    | 0.8 (0.5-1.2)  | 0.4         |
|                             | None                 | 333 (34.5)   | 632 (65.5) | (reference)    | (reference) |
| Extra salt on regular meals | Always               | 33 (26.6)    | 91 (73.4)  | 2 (1.3-3.1)    | 0.001       |
|                             | Sometimes            | 159 (30.5)   | 363 (69.5) | 1.6 (1.2-2.1)  | <0.001      |
|                             | Never                | 200 (42.5)   | 271 (57.5) | (reference)    | (reference) |
| Fizzy drink                 | Always               | 20 (21.3)    | 74 (78.7)  | 3 (1.6-5.4)    | <0.001      |
|                             | Sometimes            | 301 (34.7)   | 567 (65.3) | 1.5 (1.1-2.1)  | 0.01        |
|                             | Never                | 72 (45)      | 88 (55)    | (reference)    | (reference) |
| Lack of sleeping            | Always               | 25 (18.7)    | 109 (81.3) | 3.8 (2.3-6.2)  | <0.001      |
|                             | Sometimes            | 219 (32.7)   | 451 (67.3) | 1.8 (1.3-2.4)  | <0.001      |
|                             | Never                | 147 (47)     | 166 (53)   | (reference)    | (reference) |
| habitual physical exercise  | None                 | 212 (32.8)   | 434 (67.2) | 1.6 (1.1-2.4)  | 0.01        |
|                             | Max 2 h/week         | 126 (35.9)   | 225 (64.1) | 1.4 (0.9-2.1)  | 0.09        |
|                             | >2 h/week            | 53 (44.5)    | 66 (55.5)  | (reference)    | (reference) |
| Vegetables and fruits       | Frequent consumption | 225 (36.1)   | 398 (63.9) | 0.8 (0.4-1.4)  | 0.5         |
|                             | Moderate consumption | 147 (33.9)   | 286 (66.1) | 0.9 (0.5-1.6)  | 0.7         |
|                             | Rare/no consumption  | 21 (32.3)    | 44 (67.7)  | (reference)    | (reference) |
| Fried food frequency        | Frequent consumption | 89 (31.7)    | 192 (68.3) | 1.3 (0.7-2.3)  | 0.2         |
|                             | Moderate consumption | 276 (35.8)   | 494 (64.2) | 1.1 (0.6-1.8)  | 0.6         |
|                             | Rare/no consumption  | 26 (38.8)    | 41 (61.2)  | (reference)    | (reference) |
| Meat consumption frequency  | Frequent consumption | 86 (36.6)    | 149 (63.4) | 0.9 (0.5-1.4)  | 0.7         |
|                             | Moderate consumption | 265 (34.3)   | 507 (65.7) | 1.01 (0.6-1.5) | 0.9         |
|                             | Rare/no consumption  | 38 (34.5)    | 72 (65.5)  | (reference)    | (reference) |
| With bread                  | Frequent consumption | 225 (32.8)   | 460 (67.2) | 1.6 (1.07-2.3) | 0.02        |
|                             | Moderate consumption | 110 (35.8)   | 197 (64.2) | 1.4 (0.9-2.1)  | 0.1         |
|                             | Rare/no consumption  | 51 (44)      | 65 (56)    | (reference)    | (reference) |

Finally, all significant risk factors were entered in the multiple logistic regression model (Table 3).

Adjusted results showed taking H<sub>2</sub>Ras (OR=4.7, 95% CI: 2.3-9.4, p<0.001), insufficient sleep

(OR=2.6, 95% CI: 1.5-4.8, p=0.001), taking PPIs (OR= 2.2, 95% CI: 1-5, p=0.045), consuming white bread (OR=1.7, 95% CI: 1.05-2.7, p=0.02), having meals very fast (OR=1.5, 95% CI: 1.1-2,

p=0.008), having salty meals (OR=1.5, 95% CI: 1.05-2, p=0.02), and education level (OR=0.5, 95% CI: 0.3-0.8, p=0.004) were statistically significant risk factors for GERD.

**Table 3: Significant factors associated with GERD (Multivariate analysis)**

|                             | Factor                 | Multivariate |           |         |
|-----------------------------|------------------------|--------------|-----------|---------|
|                             |                        | OR           | 95% CI    | P value |
| Educational 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                 | Yes                    | 2.2          | 1-5       | 0.045   |
|                             | No                     |              | Reference |         |
| Use of H <sub>2</sub> Ras   | Yes                    | 4.7          | 2.3-9.4   | <0.001  |
|                             | No                     |              | Reference |         |
| Use of NSAIDs               | Yes                    | 1.6          | 1.2-2.3   | 0.002   |
|                             | No                     |              | Reference |         |
| Habit of quick eating       | Yes                    | 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 |         |

PPIS: Proton Pump Inhibitor; H<sub>2</sub>RaS: H<sub>2</sub> Receptor Agonists or H<sub>2</sub> Blockers; NSAIDS: Nonsteroidal Anti-inflammatory Drugs.

## Discussion

Our findings indicate that the prevalence of GPRD was about 28%. The most important risk factors were taking H<sub>2</sub>RAs medicine, insufficient sleep, taking PPIs medicine, consumption of white bread, having meals very fast, taking in extra salt with food, and education level respectively.

Based on our search at the time, a few studies were done about the relationship between the prevalence of GPRD and its risk factors in Iran [5-7]. In this study the prevalence of GPRD was estimated as 28%, while previous studies reported 18.2 & 12.3% in Tehran and Gonbad-Kavous respectively [6,13]. The prevalence of GPRD in Iran has been reported much higher than the other Asian countries. However, Iran GPRD prevalence is comparable with the one in the USA, Turkey,

southern India, Greek and Moscow [1,4,14,15]. The less prevalence of GPRD in Asian countries were attributed to consuming less oily foods [1,9]. The least GPRD prevalence was reported for China and the most for the USA [1].

We did not find any significant relation between the age and GPRD like three other studies [9,16,17]; two studies reported a positive relation, [18,19] and two reverse relation [20,21]. Our results may be due to age range of participants which was low.

Univariate analysis showed that obesity is a predictor of GPRD, however, adjusted results did not. Yamamichi reported adjusted BMI as a predictor of GPRD [2]. Other studies also showed BMI as the predictor of GPRD [6,9,22-24]. HUNT2, a population based study, provided some evidence that obesity had a positive relationship

with GPRD [25]. Furthermore, a systematic review [26] also showed a significant relationship between obesity and GPRD. Our results in regard of obesity may be due to low sample size.

Taking H<sub>2</sub>RAs and PPIs in both unadjusted and adjusted analysis were appeared to be significant predictors of GPRD. This result was also shown by Yamamichi et al [2]. This study evaluated the relationship between GPRD and the wide range of life style risk factors. Among them, the habit of midnight snack, quick eating, having dinner very late, not having breakfast, drinking tea, taking extra salt when having dinners, fizzy drinks, insufficient sleep, and consumption of white bread appeared to be statistically significant predictors of GPRD. All above mentioned adjusted risk factors in the Japanese study [2] were also confirmed as statistically significant predictors of GPRD. The most significant adjusted variables were insufficient sleep, obesity, having late dinner, and having snack at night time respectively.

We did not find any relationship between neither drinking coffee and GPRD, nor8 did not Nilsson et al [27], Nocon et al [23] and Nasserri et al [6]. However, Yamamichi et al [2] found a moderate significant relationship. In this study, there was no evidence against red meat and GPRD, and in turn, fat. Nocon et al [23], Nasserri et al [6] and Çela et al [9], found similar results. Matsuki et al [28] in NERD patient group, and El-Serag et al [29] reported lipid as a GPRD risk factor. Consumption of extra salt at the time of having meals was reported as a significant predictor of GPRD [27], however, Matsuki et al [28] did not provide any important evidence against it.

The association between smoking and GPRD was confirmed in our findings and by [6,9,23,30]. Different studies showed different results in different directions on relationship between regular exercise (physical activity) and GPRD [5,27,31-33]. This study provided a pattern against lack of exercise, the higher number of exercise, the lower risk of GPRD.

This study has some strong advantage including the sample size. However, this is a cross-sectional study and prone to usual pitfalls of such studies. This cross-sectional study showed a high prevalence of GPRD in Iran and provided

evidence on the association between GPRD and taking H<sub>2</sub>RAs medicine, insufficient sleep, taking PPIs medicine, consumption of white bread, having meals very fast, and taking in extra salt with food

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