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Original research

The association between gastroesophageal reflux and Physical activity of individuals among the population of PERSIAN Guilan cohort study (PGCS)

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Abstract

This study was conducted to investigate the correlation between gastroesophageal reflux disease (GERD) and levels of physical activity in the Prospective Epidemiological Research Studies of the Iranian Adults (PERSIAN) Guilan cohort population (PGCS). This study is a across-sectional survey on 10520 individuals of PGCS from 2014 to 2017. Demographical study and clinical characteristics including age, gender, a history of alcohol consumption and smoking, body mass index (BMI), and level of physical activity were collected via questionnaire. The statistical data was analyzed using SPSS version 16 with considering a significant level less than 0.05. The analysis of the data illustrated that out of 10520 individuals, 1385 (13.2%, 95%CI: 12.5-13.8) patients had GERD. Low level of physical activity, female gender, middle age, and upper BMI were reported to had associate with higher GERD (P<0.05). The adjusted analysis showed that the GERD significantly associated with low physical activity (OR: 1.15, 95%CI: 1.01-1.33, P=0.044). Due to our results, GERD was reported higher in females, middle age, overweight individuals, and low level of physical activity.

Keywords: Physical activity, Gastroesophageal reflux, Cohort study

1. Introduction

Gastroesophageal reflux disease (GERD) is among the most common complications in outpatient gastroenterology clinics around the world, which is represented by heterogeneous symptoms that develop due to retrograde reflux of gastric contents in the esophagus [1]. According to previous studies, over the last decade, there has been a noticeable increase in the number of patients with GERD. A significant difference between the weekly and overall prevalence of GERD was reported in different origins in Iran, and the global prevalence of GERD is increasing over time [2]. The aging and female gender has been reported to associate with an increased risk for GERD symptoms, while the prevalence of GERD in younger ages is reported to increase in recent years [3–5]. Alcohol consumption and smoking were also illustrated to associate with a higher incidence of GERD among the population [6,7].

Previously, associated risk factors for GERD were reported, including genetic susceptibility, higher body mass index (BMI), smoking, and lower economic status [8]. While the potential role of physical activity is complex, intense physical activity is known to trigger reflux symptoms [9]. It has been reported that reflux is associated with the duration and amount of physical activity. During exercise, GERD may be increased in athletes due to decreased blood flow of the gastrointestinal tract, hormone alternation, changes in

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the esophagus, and gastrointestinal motor function [9].

Further investigation on the prevalence of GERD according to the levels of physical activity and associated risk factors will be helpful for clinicians to better clinical management of GERD and its symptoms to improve quality of life and prevent GERD and related complications. On the other hand, due to the importance of regular physical activity on an individual's health, we aimed to conduct this study to evaluate the frequency of GERD according to the levels of physical activity among Prospective Epidemiological Research Studies of the Iranian Adults (PERSIAN) Guilan cohort study's population (PGCS).

2. Materials and Methods

2.1 Participants

This is a cross-sectional study according to the PERSIAN cohort study [10] in Guilan, Iran, included 10520 participants aged 35 to 70 years October 2014 to January 2017 [11]. The demographical data and clinical characteristics included age, gender, history of smoking, alcohol consumption, BMI, and Metabolic Equivalent of Task (MET) were collected through questionnaire. BMI categorized as low weight (BMI<18.5 kg/m2), normal weight (BMI=18.5–24.99 kg/m2), overweight (BMI=25–29.9 kg/m2), and obese (BMI≥30 kg/m2) was recorded. MET categorized into three tertiles by low (< 36.1), medium (36.1-42.8), and high (>42.8) levels of activity in a day by assessing the amount of hours of working, walking, exercise and etc.; and participants were classified into GERD and non-GERD groups according to the levels of physical activity. A history of GERD was self-report, which was diagnosed by a specialist.

2.2 Statistical analysis

In the present study, variables were presented in number and percentage. Chi-square test was used to compare observed results with expected results with 95% CI and the level of significance less than 0.05. Simple and multiple logistic regression analyses were performed to examine the relationship between physical activity and GERD. All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 16.0 (IBM Corp., Armonk, NY, USA).

3. Results

The demographic data and clinical characteristics of 10520 participants according to the presence or absence of GERD was illustrated in Table 1. A total frequency of GERD was reported to be (13.2%, 95%CI: 12.5-13.8) among the participants. The average age of individuals without GRED was 51.49±8.91 years old, and for individuals with GERD was 51.64±8.77 years old, (P=0.576). Individuals with low (n=501) and moderate (n=467) levels of physical activity compare to whom with high level of physical activity (n=417) represented higher frequency of GERD (P=0.010). The GERD was reported to be higher in females (n=834) than in males (n=551). Moreover, individuals with age group of 45-55 years old represented higher prevalence of GERD, however no statistically significant correlation was reported (P>0.05).

According to our results, the prevalence of GERD was higher in patients with moderate physical activity (n=520) compare to patients with a low and high level of physical activity (n=394 and n=471), respectively. The majority of patients with GERD and low levels of physical activity had higher BMI as overweight (n=553) and obese (n=490), (P<0.001). Among smokers, the prevalence of GERD was higher in patients with a high level of physical activity (P<0.001). Though, there was no statistically significant association between physical activity and alcohol consumption among patients with GERD (P>0.05).

The adjusted analysis showed that the GERD significantly associated with low physical activity (OR: 1.15, 95%CI: 1.01-1.33, P=0.044) (Table 2).

4. Discussion

GERD is one of the most common health issues all around the world. Besides environmental factors and genetic susceptibility, changes in diet, and physical activity affect its prevalence. A higher prevalence of GERD requires more attention to related risk factors to better clinical management and improve the patients' quality of life. Due to our results, in the low-physical activity group, female gender, middle age, and higher BMI were more frequent in patients with GERD. Also, among men and smokers with a high level of physical activity, a higher frequency of GERD was reported.

According to various evidence regarding the association between gender and GERD symptoms, it

Table 1. The frequency of demographical data of individuals with and without GERD among Guilan PERSIAN cohort study population.

Variables		GERD n (%) 1385 (13.2%)			P value	No-GERD n (%) 9135 (86.8%)			P value
		Physical activity				Physical activity			
		Low	Middle	High		Low	Middle	High	
Age (year)	35-45	131 (33.2)	146 (37.1)	117 (29.7)	0.060	894 (32.6)	897 (32.7)	954 (34.8)	<0.001
	45-55	176 (33.8)	176 (33.8)	168 (32.3)		1001 (30.0)	1125 (33.7)	1208 (36.2)	
	55<	194 (41.2)	145 (30.8)	132 (28.0)		1106 (36.2)	1016 (33.2)	934 (30.6)	
Gender	Male	172 (31.20	141 (25.6)	238 (43.2)	<0.001	1220 (28.1)	1127 (26.0)	1989 (45.9)	<0.001
	Female	329 (39.4)	326 (39.1)	179 (21.5)		1781 (37.1)	1911 (39.8)	1107 (23.1)	
BMI	<18.5	3 (25.0)	2 (16.7)	7 (58.3)	<0.001	35 (27.1)	33 (25.6)	61 (47.3)	<0.001
	18.5≤BMI<25	97 (29.4)	98 (29.7)	135 (40.9)		636 (26.3)	719 (29.8)	1061 (100.0)	
	25≤BMI<30	198 (35.8)	164 (35.1)	161 (29.1)		1188 (32.6)	1226 (33.6)	1231 (33.8)	
	30<	203 (41.4)	173 (35.3)	114 (23.3)		1142 (38.8)	1061 (36.0)	743 (25.2)	
Alcohol consumption	Yes	61 (35.5)	50 (29.1)	61 (35.5)	0.206	358 (29.3)	304 (24.9)	561 (45.9)	<0.001
	No	440 (36.3)	417 (34.4)	356 (29.3)		2643 (33.4)	2732 (34.5)	2535 (32.0)	
Smoking	Yes	85 (27.5)	78 (25.2)	146 (47.2)	<0.001	662 (29.1)	575 (25.3)	1038 (45.6)	<0.001
	No	416 (38.7)	389 (36.2)	271 (25.2)		1229 (34.1)	2463 (35.9)	2058 (30.0)	

Body mass index (BMI); Gastroesophageal reflux disease (GERD); Significant level of P value <0.05.

Table 2. Regression model for association between Physical activity and GERD

Level of physical activity	Crude OR and 95 % CI	P-value	Adjusted OR and 95 % CI	P-value
Low	1.23 (1.07-1.42)	0.003	1.15 (1.01-1.33)	0.044
Middle	1.14 (0.99- 1.31)	0.067	1.05 (0.91-1.21)	0.473
High	Ref	-	Ref	

OR: Odds Ratio; CI: Confidence Interval
[a] adjusted by Age and Gender

was illustrated that GERD was more frequent in females than males [5,12]. On the other hand, some studies show no relationship between genders [13]. The prevalence of GERD symptoms was reported to be significantly higher in patients with upper age [14,15]. Ness-Jensen et al. reported in their study that the incidence of GERD-related symptoms increased with age [16]. Similar to our results, female patients, middle and upper age groups represented a higher frequency of GERD.

In line with our findings, many studies have reported a higher rate of GERD in overweight and obese individuals, which indicates a link between higher BMI and GERD [17–19]. Previous studies

reported a high prevalence of GERD in smokers compared to lower rates in non-smokers [20–24], in which, in control of GERD symptoms, the improving results of smoking cessation have been previously reported [25]. In the present study, the smoker with higher level of physical activity, the frequency of GERD was reported to be higher than ones with low and middle levels of physical activity. Also, the consumption of alcohol was reported to have no significant association with GERD according to three levels of physical activity, which was close to Nirwan et al.'s study; they also reported similar GERD prevalence in those with a moderate to a high levels of alcohol compared with those who do not consume alcohol or have low alcohol [26].

Moreover, exercising more than one times per week associated with the risk factor for developing GERD [27], in which it illustrated a decrease risk of GERD at a higher level of physical activity [21,28]. In a recent study, it was reported that frequent physical activity was a risk factor in patients with a high level of MBI>30 but not in patients with normal or low BMI [29]. Due to our results, in patients with low and moderate levels of physical activity had a higher frequency of GERD compare to ones with higher level of physical activity. Frequent physical activity can cause stress, which results in compressed gastric contents and disturbs the normal motor function of the lower esophageal sphincter which reduces blood flow to the stomach [9,30].

4.1 Limitations

On of the limitation of our study refers to the low number of the individuals in smokers and low-BMI groups, which could affect the result of the analysis. In this regard, further study to evaluate the association between physical activity and GERD is recommended.

This study showed a high prevalence of GERD among females and middle ages. Also, individuals with normal BMI and higher physical activity represented lower frequency of GERD.

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Not applicable.

Authors' contributions

AH designed the study and wrote the whole manuscript. FMGH cooperated in study design and supervised. AH, FMGH both cooperated in data collection and analysis. All authors read and approved the final version of manuscript.

Conflict of interests

No conflict of interests was reported.

Ethical declarations

This study was approved by the ethics committees at the Ministry of Health and Medical Education and the Guilan University of Medical Sciences (P/3/132/215).

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