ASTHMA, RHINITIS AND ROAD SAFETY

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Abstract

Introduction: injuries from traffic accidents constitute one of the main health problems for the global population in the early 21st century. This study aims to determine if there is a greater prevalence of accident-causing driving among individuals diagnosed with asthma and/or rhinitis.

Method: patients visiting two health centers who were not afflicted with chronic disease were recruited consecutively over the course of three months. All participants ranged between 18 and 65 years old, and were habitual drivers. A group of ill patients with a diagnosis of asthma/rhinitis were also recruited from the pulmonology, allergy and ENT departments at the Hospital de Jerez. These patients were interviewed following a predetermined questionnaire, collecting demographic data, tobacco use, history of driving accidents, characteristics of the asthma and rhinitis and the Goldberg Anxiety-Depression Scale (GADS) was used to evaluate the existence of a psychiatric comorbidity. The prevalence of accidents was calculated in each group and among the patients with a diagnosis of rhinitis/asthma, as well as according to diagnosis and severity.

Results: 424 healthy individuals (49.3% women) were interviewed with an average age of 38. We also interviewed 185 patients with asthma/rhinitis (52.4% women), with an average age of 45. Of those interviewed, 67.6% suffered from rhinitis with or without asthma. A total of 33.8% of the control group and 41.6% of asthmatic patients ($p < 0.001$) reported having suffered traffic accidents. Patients suffering only from rhinitis ($n = 125$) had more accidents than the healthy population in the control group (0.48 ± 0.51 vs 0.34 ± 0.47; $p < 0.001$). Accidents showed a correlation with the level of asthma control and the severity of asthma and rhinitis.

Conclusions: there is a higher rate of driving accidents among individuals suffering from asthma and rhinitis, which may be related to the severity of these illnesses.

Key words: Asthma, rhinitis, road safety, traffic accidents.

ASMA, RINITIS Y SEGURIDAD VIAL

Resumen:

Introducción: Las lesiones por accidente de tráfico constituyen uno de los principales problemas de salud de la población mundial en los inicios del siglo XXI. En este estudio nos planteamos estudiar si existe una mayor prevalencia de accidentalidad en la conducción en personas con diagnóstico de asma y/o rinitis.

Método: Se eligieron, de forma consecutiva durante un periodo de tres meses, a pacientes que acudieron a consultas de dos centros de Salud sin aquejar patología crónica, todos ellos con un rango de edad entre 18 y 65 años, conductores habituales y a un grupo de enfermos de las consultas de neumología, alergia y ORL de Hospital de Jerez, con diagnóstico de asma/rinitis. A estos pacientes se les entrevistó siguiendo cuestionario preestablecido, recogiéndose datos demográficos, consumo de tabaco antecedentes de siniestralidad en la conducción, características del asma y la rinitis y la escala Goldberg *Anxiety*-Depression (GADS) para la valoración de la existencia de comorbilidad psiquiátrica. Se calculó la prevalencia de accidentalidad en cada grupo y en los pacientes con diagnóstico de rinitis/asma, también en función de estos diagnósticos y su gravedad.

Resultados: Se entrevistó a 424 personas sanas (49,3% mujeres) de 38 años de edad media y a 185 pacientes asmáticos/riníticos (52,4% mujeres), con edad media de 45 años. Un 67,6% de ellos padecían rinitis con o sin asma. Referían haber sufrido accidentes de tráfico un 33,8% del grupo control y el 41,6% de los pacientes asmáticos ($p < 0,001$). Los pacientes que presentaban solamente rinitis ($n = 125$) concentraron más accidentes que la población sana del grupo control ($0,48 \pm 0,51$ vs $0,34 \pm 0,47$; $p < 0,001$). La siniestralidad mostró relación con el grado de control del asma y la gravedad del asma y rinitis.

Conclusiones: Existen indicios de una mayor siniestralidad en la conducción entre personas asmáticas y riníticas, que podría estar relacionada con la gravedad de estas patologías.

Palabras clave: Asma, rinitis, seguridad vial, accidentes de trafico.

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INTRODUCTION

Injuries from traffic accidents constitute one of the main health problems for the global population in the early 21st century. In the first few decades, they became one of the most prevalent health problems in developed countries, in which they represent the leading cause of death between ages 5 and 44. The health impact is even greater, as half of all serious head injuries and 60% of all spinal injuries are the result of a traffic accident.

In Spain, a total of 1,348 fatal accidents were registered in 2013, resulting in 1,680 deaths. In addition, there were 89,519 accidents with victims and 10,086 serious injuries[1].

Human factors were identified as the cause of the accident in 71% to 93% of cases[2]. Within comorbidities, particular emphasis has been placed on sensory organ (sight, hearing) defects and cardiovascular (arrhythmia, coronary heart disease), metabolic (hypoglycemia in diabetics), neurological and/or psychiatric alterations. The incidence of chronic airway inflammation (rhinitis and asthma) is on the rise and, in the case of allergies, seasonality and the age affected (youth) determine an infraevaluation of the impact these illnesses have on activities that require maximum attention, such as driving.

Rhinitis and sinusitis are very prevalent illnesses. In Spain, an estimated 21% of the population suffers from allergic rhinitis (of which the highest percentage corresponds to moderate-serious)[3] and around 5-15% suffers chronic sinusitis, while 2% of the population has sinonasal polyposis[4]. Additionally, the prevalence of asthma reached 7% of the general population in the most recent studies[5].

As a result, for nearly the nearly 10 million people suffering from problems related to allergic processes, driving vehicles can be affected by the illness and even become dangerous. Few studies have been done on this matter, but they point to a higher incidence of accidents in people with rhinitis or asthma derived from allergic processes. In the case of asthma, upon analyzing the incidence of health factors and their influence on traffic accidents in the Community of Madrid in 2006 and 2007, Kanaan A. et al.[6] found that the two entities most frequently associated with accidents were high blood pressure and asthma (detected in 6.6% of cases), followed at quite a distance by depression and epilepsy (2.8%). Previous studies have identified syncope from coughing fits as a risk factor for accidents[7-9]. However, recent publications indicate that patients suffering from allergic rhinitis do not have deteriorated driving reflex capacity and memory[10]. Nevertheless, a few years ago, Mapfre released a report stating that allergies were responsible for 100 deaths per year in traffic accidents in Spain[11].

Our objective in this study is to analyze whether there is a higher rate of driving accidents in the population with asthma and/or rhinitis in our healthcare area, determining the prevalence of previous accidents this group has had. With this, we aim to shed some light on the risks of these illnesses with regard to road safety and if these illnesses can be considered risk factors affecting driving.

MATERIAL AND METHODS

A cross-sectional observational epidemiological analysis was done with case and control groups from October 2013 to September 2014.

For the patient group, participants with a diagnosis of rhinitis/asthma were consecutively recruited while attending an appointment at the Pulmonology/Allergy and Otolaryngology departments at the Hospital de Jerez, provided they met the requirement of being habitual drivers (at least twice a week). The asthma diagnosis was based on the criteria found in the Spanish Guide for Asthma Management (GEMA)[12], with regard to compatible clinical symptoms and obstruction reversibility with FEV_1 >12% and >200 ml or FeNO >50 ppm or PEF variability or positive nonspecific provocation. The rhinitis diagnosis was based on the definition from the European Academy of Allergy and Clinical Immunology's document "Allergic Rhinitis and Its Impact on Asthma" (ARIA)[13]. The allergy diagnosis was based on compatible clinical symptoms with skin tests using the prick test and/or determining positive specific serum IgE for common pneumoallergens in the environment. The diagnosis of polyposis was based on imaging tests and/or ENT exams.

Participants for the control group were selected consecutively from patients attending appointments at two health centers in the healthcare area in northern Cádiz (La Serrana Health Center and Jerez-Norte). Participants did not suffer previous illness, ranged from 18-65 years old, and were habitual drivers.

The study was carried out after approval from the respective local ethics committees and all patients gave their written consent to participate.

Patients were interviewed following a pre-determined questionnaire. Demographic data, tobacco use and history of driving accidents (number of previous accidents) were collected, as well as several characteristics of their

illness and treatment. The Goldberg Anxiety-Depression Scale (GADS) was also used[14]. The GADS questionnaire asks how interviewees have felt in the past month using nine anxiety items and nine for depression, to which they answer "yes" or "no".

A driving accident was defined as that which occurs on the minor roads or territory for the circulation of motor vehicles which are under traffic legislation, provided this accident results in one or more deaths or injuries or only causes material damage, provided a moving vehicle is involved. Accidents with victims are considered those in which one or several people are killed or injured. Accidents with only material damage are those in which no death or injury has occurred. Participants were also asked about accidents without victims or material damage resulting from the loss of control while driving a vehicle. Injuries were considered serious when the person injured in the accident was hospitalized for longer than 24 hours. Minor injuries are those which do not meet the definition for serious injury.

Those individuals who were not habitual drivers (did not drive at least two days a week), those with factors related to psychomotor driving problems, a history of previous treatments that affected driving, the presence of symptoms compatible with sleep apnea syndrome, associated comorbidity or psychiatric involvement and those who consumed alcohol or psychotropic drugs were excluded.

Asthmatic patients were classified according to severity and degree of control according to GINA (Global Initiative for Asthma) criteria[14]. Data was collected regarding exacerbations, which were considered to be those episodes requiring treatment with systemic steroids, emergency room visits or hospitalization.

Patients with rhinitis were grouped according to severity, following the criteria in the ARIA (Allergic Rhinitis and Its Impact on Asthma) document[13].

For our main objective in this study, we calculated and compared the prevalence of history of driving accidents in the active groups (patients with a diagnosis of asthma/rhinitis) versus the control group. For the secondary objectives, we calculated and compared the prevalence of history of accidents according to severity and the degree of asthma control and to the severity of the rhinitis.

Statistical analysis: a preliminary analysis was done to calculate the sample size. Considering a difference of 5% in accidents between the different groups, it was decided that 500 patients were needed for 95% power and level of significance α of 0.05.

All of the statistical analyses were done using the SPSS package, Chicago Illinois, version 22. A descriptive analysis was done of all the variables included in our study sample. The results are expressed as percentages, frequencies and the number of observations for the qualitative variables and as averages with standard deviation for the quantitative variables. The general and secondary mental state scores in patients and control participants were calculated, comparing the averages using the Mann-Whitney U test. Comparisons between groups were done using the χ^2 test for categorical variables and with the Kruskal-Wallis test for ordinal and quantitative variables, after confirming values did not follow a normal distribution.

RESULTS

A total of 424 healthy individuals were interviewed for the control group (50.7% male and 49.3% female) averaging 38 years old, with an average body mass index (BMI) of 24.7 ± 4 kg/cm^2 (SD: standard deviation). Non-smokers accounted for 56.6% of the sample, while the percentage for smokers was 27.1% (at an average of 23 ± 20 packs/year) and former smokers made up 16.3%. A total of 33.8% reported having a traffic accident. Of these, 21% reported one accident, 9.9% two and 4.2% had had more than two prior accidents.

For the case group, 185 patients were interviewed averaging 45 years old (52.4% women and 47.6% men). The demographic and clinical characteristics of the patient sample with asthma and/or rhinitis are included in Table 1.

The characteristics of the general sample are included in Table 2. It is worth noting that age differences were found in the control population (somewhat lower in this group and significantly different when comparing the females with the asthmatic group). Tobacco use was also different in both groups.

In the group of asthmatic patients, concomitant rhinitis stands out to a greater extent at 67.6% (70.5% in men and 65% in women). Comorbidity data is included in Table 3.

There were no significant differences in any of the parameters (anxiety or depression) between the control group and patients measured with the GADS.

With respect to the medication used, the majority of asthmatic patients

used a combination of inhaled corticosteroids (ICS) + long-acting β2-agonist (LABA) (75.6%), ICS (10%), antileukotrienes (52.8%), omalizumab (20.7%), on-demand salbutamol (59.4%), and oral corticosteroids (5.4%). In patients with rhinitis, the most frequent treatments were antihistamines (35.7%), but a first-generation H1-antagonist was found in one case, followed by topical corticosteroids (29.7%), nasal antihistamines (83.3%) and immunotherapy (2.2%). Other drugs detected include: antiulcer drugs (22.2%), anxiolytics (16.2%), diuretics (7.6%), antidepressants (5.4%), beta-blockers (4.3%), and calcium antagonists (4.3%).

With regard to the objective of the study, Table 4 shows the data from the road safety survey. The asthmatic group showed a higher prevalence of traffic accidents in comparison with the control group. There were also significant differences in the time at which these accidents occurred and the season of the year in which the accidents took place reached statistical significance, with more than half of accidents in the asthmatic group being concentrated in the spring and fall (Table 4). There were no significant differences in the severity of the injuries caused by the accidents, although the only case in which deaths occurred was registered in the asthmatic group. The majority of patients indicated that their illness interfered with driving vehicles and up to 77.7% associated their illness with the traffic accidents.

If we analyze the patients suffering only from rhinitis (n = 125), they experienced more accidents than the healthy population in the control group (0.48 ± 0.51 vs 0.34 ± 0.47; $p < 0.001$). A total of 47.2% of patients with rhinitis (n = 59) reported previous accidents compared to 33% in those not suffering from this condition. Within the asthmatic group, those presenting with concomitant rhinitis also showed a higher proportion of history of traffic accidents (47.2% vs 31.7% in the asthmatic group without rhinitis, n = 60; $p < 0.001$).

If we consider the severity and control of the asthma, as well as accident rate based on the length or severity of rhinitis symptoms, we see the differences in figures 1, 2, 3 and 4 (only significant differences are indicated in the charts).

Table 1. Clinical and demographic characteristics of asthmatic patients

Variable	Female (n = 97)	Male (n = 88)	All (n = 185)
Average age (SD)	47 ± 11	43 ± 13	45 ± 12
Average BMI (SD)	26.8 ± 4	26.8 ± 4	26.8 ± 4.0
Tobacco (%)			
Non-smoker	69.1 %	53.4 %	61.6%
Smoker	16.5 %	18.2%	16.2%
Former smoker	14.4 %	28.4%	22.2%
Packs/year	11 ± 8	14 ± 8	12 ± 8
Hospitalizations due to asthma, n (%)			
Patients hospitalized	9 (9.6%)	9 (10.3%)	18 (9.9%)
Number of hospitalizations per patient	0.13 ± 0.42	0.1 ± 0.3	0.11 ± 0.36
Trips to the emergency room (previous year)	32 (34%)	29 (33.3%)	61 (33.7 %)
Unplanned medical visits (previous year)	32 (34%)	19 (21.8%)	51 (28.2%)
Years of asthma evolution (years)	8 ± 5	11 ± 9	9 ± 8
Asthma control (GINA) (%)			
Controlled	46.2%	52.9%	49.4%
Partially controlled	34.4%	28.7%	31.7%
Uncontrolled	19.4%	18.4%	18.9%
GINA SEVERITY, (%)			
Intermittent	8.6%	12.6%	10.6%
Mild persistent	28.0%	34.5%	31.1%
Moderate persistent	45.2%	40.2%	42.8%
Severe persistent	18.3%	12.6%	15.5%
Spirometry (average (SD))			
FEV1, ml	2490 ± 765	3478 ± 1023	3014 ± 1033
FEV1, %	88.1 ± 21.2	87.5 ± 22.6	87.8 ± 22
FEV1/FVC %	74.6 ± 11.7	71 ± 11	73 ± 11

SD: standard deviation; BMI: body mass index, FEV1: maximum volume exhaled in the first second.

Table 2. Control group and asthmatic patient comparison

	Control Group			Asthma Group		
	All (control) (n = 424)	Female (control) (n = 209)	Male (control) (n=215)	All (asma) (n =185)	Female (asma) (n = 97)	Male (asma) (n = 88)
Average age (SD)	38 ± 12	37 ± 13	39 ± 13	45 ± 12	47 ± 11#	43 ± 13
Average BMI* (SD)	24.7 ± 4	24 ± 4	25.4 ± 4	26.8 ± 4.0	26.8 ± 4	26.8 ± 4
Tobacco (%)						
Non-smoker	56.6	54.1	59.1	61.6%	69.1 %#	53.4 %*
Smoker	27.1	28.2	26.0	22.2%	14.4 %	18.2%
Former smoker	16.3	17.7	14.9	16.2%	16.5 %	28.4%
Packs/year	23.3±21	17± 15	30± 24	12 ± 8	11 ± 8#	14 ± 8*
GADS* Total	4.9 ± 4.5	5.5 ± 4.7	4.4 ± 4.2	4.7 ± 4.6	4.8 ± 4.9	4.6 ± 4.2
GADS* Anxiety	3.2 ± 2.7	3.4 ± 2.8	2.8 ± 2.6	3.0 ± 2.2	3.0 ± 2.7	2.9 ± 2.5
GADS* Depression	1.8 ± 2.2	2.0 ± 2.2	1.6 ± 2.1	1.7 ± 2.4	1.7 ± 2.6	1.7 ± 2.2

¶ Significant differences between control group and asthma group.
* Significant differences between control group men and asthmatic men.
# Significant differences between control group women and asthmatic women.

Table 3. Comorbidity in the asthmatic patients group

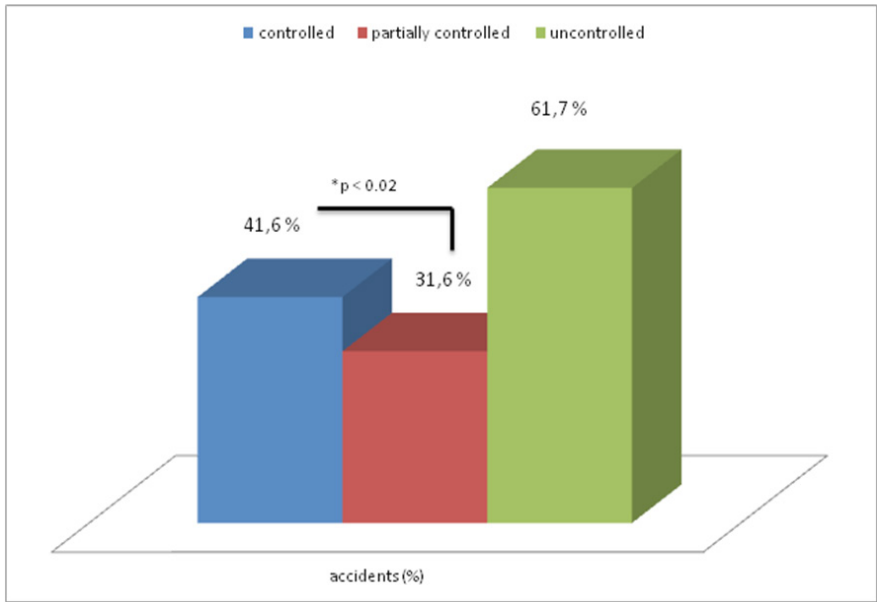
	All (n = 185)	Male (n = 88)	Female (n = 97)
Rhinitis (n, %)	125 (67.6%)	62 (70.5%)	63 (64.9%)
Intermittent	25.6%	29.6%	28.5%
Persistent	74.4%	70.4%	71.4%
Mild	41.6%	48.4%	34.9%
Moderate	54.4%	45.2%	63.5%
Severe	4.0%	6.4%	1.6%
Polyposis	32 (17.3%)	11 (12.5%)	21 (21.6%)
Gastroesophageal reflux	28 (15.1%)	8 (9.1%)	20 (20.6%)
Diabetes	10 (5.4%)	5 (5.7%)	5 (5.2%)
Arterial hypertension	23 (12.4%)	8 (9.1%)	15 (15.5%)
Fibromyalgia	9 (4.9%)	1 (1.1%)	8 (8.2%)
Depression	13 (7.0%)	3 (3.4%)	10 (10.3%)
Anxiety	37 (20.0%)	12 (13.6%)	25 (25.8%)

Table 4. Road safety

	Control group (n = 424)	Asthmatic group (n = 185)	p
Have you had a traffic accident? YES n (%)	141 (33.8%)	77 (41.6%)	0.000
How many? n (%)			
None	276 (65.3)	107 (58.2)	0.052
One	87 (20.6)	58 (31.5)	
Two	42 (9.9)	15 (8.2)	
> Two	18 (4.2)	4 (2.1)	
Vehicle?			
Car	98 (84.5)	67 (91.8)	0.000
Bus	4 (3.5)	3 (4.1)	
Motorcycle	14 (12)	3 (4.1)	
Season			
spring	27 (24.8)	21 (28.8)	0.088
summer	39 (35.8)	22 (30.1)	
fall	12 (11.0)	20 (27.4)	
winter	31 (28.4)	10 (13.7)	
Day of the week			
Monday	3 (3.2)	4 (5.5)	0.49
Tuesday	13 (14.0)	10 (13.7)	
Wednesday	21 (22.6)	9 (12.3)	
Thursday	20 (21.5)	29 (39.7)	
Friday	25 (26.9)	10 (13.7)	
Saturday	9 (9.7)	10 (13.7)	
Sunday	2 (2.1)	1 (1.4)	
Time			
1:00-10:00	18 (17.3)	0 (0.0)	0.018
10:00 -14:00	28 (26.9)	23 (32.4)	
14:00 -17:00	19 (18.3)	20 (28.1)	
17:00-20:00	29 (27.9)	19 (26.8)	
20:00-01:00	10 (9.6)	9 (12.7)	
Victims?			
Mild	37 (8.7)	15 (8.1)	0.12
Serious	4 (0.9)	1 (0.5)	
Fatal	0 (0.0)	1 (0.5)	

	Control group (n = 424)	Asthmatic group (n = 185)	p
Do you think your illness influenced your traffic accident(s)? YES		56 (72.7)	
Do you think your illness influences your driving? YES		84 (45.5)	

Figure 2. Percentage of patients with a history of traffic accidents as a function of the degree of asthma control



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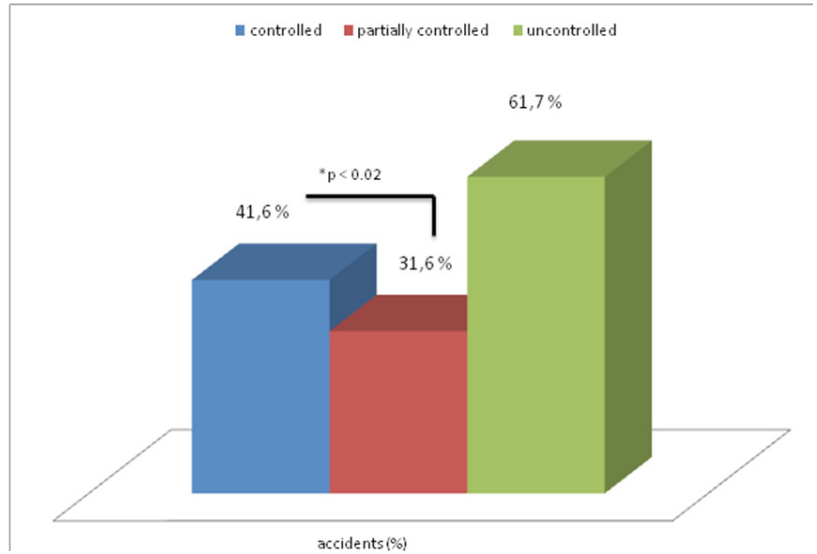


Figure 3. Percentage of patients with a history of traffic accidents depending on the severity of rhinitis

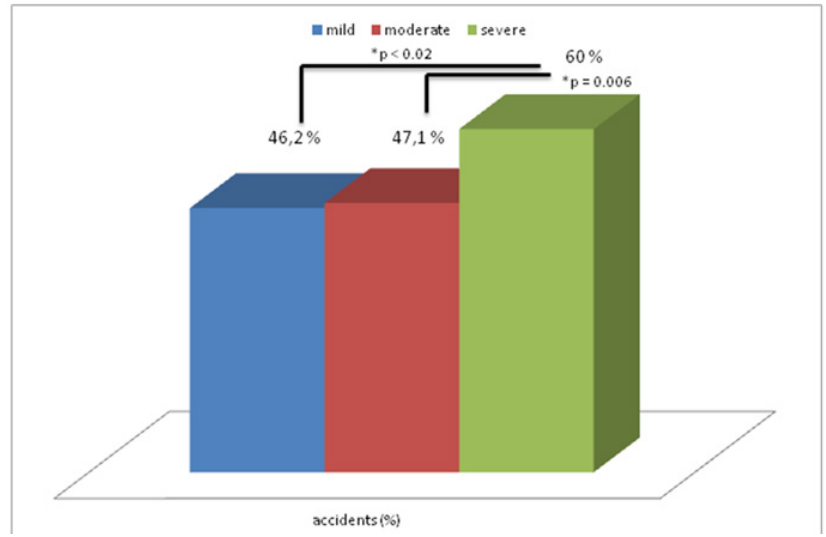
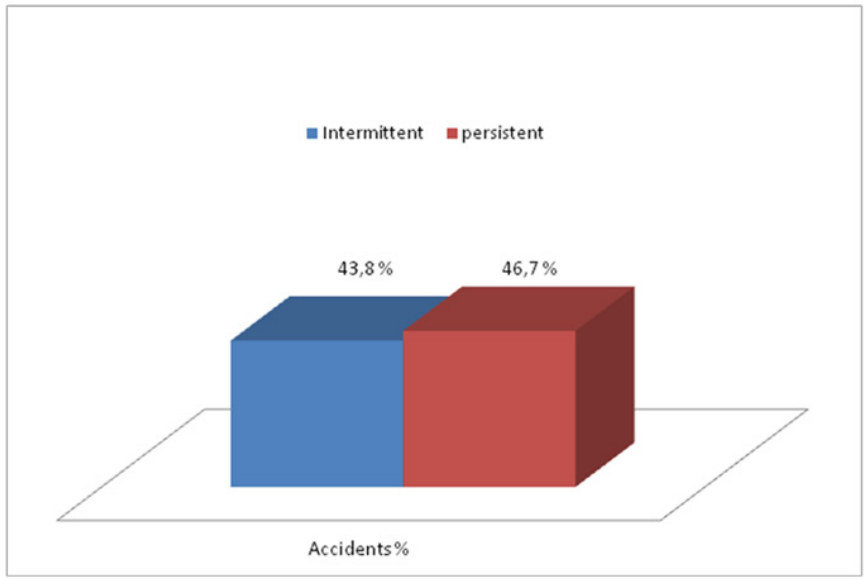


Figure 4. Percentage of patients with a history of traffic accidents as a function of the duration of rhinitis symptoms



DISCUSSION

Our study shows a higher prevalence of traffic accidents in patients with asthma and rhinitis compared to the healthy population. This accident rate is higher based on the severity of the illness.

For chronic airway inflammation illnesses, interference with the normal ability to drive vehicles is normally not considered a possible effect of these conditions on the patient's daily activities. It is likely that these factors constitute a significant part of the general limitations some patients experience, which further jeopardizes road safety[16].

It is also important to remember that 7 in every 10 people affected by allergic processes are unaware that the use of antihistamines can affect daily activities, including driving. In most cases, these are classic or first-generation antihistamines, whose sedative effects hinder psychomotor performance; thus an allergic individual under the effects of these drugs takes longer than normal to make decisions and their ability to reason and memorize is reduced, leading them to make incorrect decisions[16-18]. Some specialists believe that the risk of having a traffic accident for an allergic driver being treated with these drugs is similar to that of a person with a blood alcohol level of 0.5 grams per liter, in other words "under the influence". In our case, only one of our patients was using this type of first-generation drug. Some authors have shown that patients with moderate rhinitis did not suffer effects in their attention or psychomotor abilities to drive under laboratory conditions, although they pointed to the fact that more severe symptoms could have had a greater repercussion[19]. This study was completed under laboratory conditions with a small sample, and we must keep in mind that for a patient with rhinitis, every sneeze equates to 2-3 seconds during which time a car traveling at 110 km/h covers around 600 meters with almost no control from the driver.

There are few existing studies which indicate the relationship between asthma and/or rhinitis severity and traffic accidents. Our study has limitations, given the retrospective nature and the fact the initially determined sample size was not reached, as well as due to the presence of some confusion factors like associated comorbidity (higher in the active group). It is also true that different drugs are implicated in the risk of accident, such as opioids and benzodiazepines[20], and our study detected the use of anxiolytics in 16.2% of cases. All of these factors did not hide the association found between traffic accidents and asthma and rhinitis as a comorbid condition, which leads us to think that the severity of the bronchial disease and/or rhinitis seem to be related phenomena in an increased risk of accidents. There are previous publications which discuss the relationship between syncope from coughing fits and rhinitis symptoms and traffic accidents[7-9,21], which point to the veracity of the association found between the severity of the respiratory illness and accident rates in our study.

The reality is that current control and traffic accident prevention have similar bases to those used in other health problems. Human factors were identified as the cause of the accident in 71% to 93% of cases. Within comorbidities, particular emphasis has been placed on sensory organ (sight, hearing) defects and cardiovascular (arrhythmia, coronary heart disease), metabolic (hypoglycemia in diabetics), neurological and psychiatric alterations. However, we must remember that the incidence of allergies in our environment is increasingly higher at specific times of the year and, predominantly, among young drivers. These problems can make driving uncomfortable and even dangerous if they are not controlled. We believe it is necessary to educate

drivers with asthma and/or rhinitis about the repercussions these health problems have on driving (as we do with other aspects of their lives), the precautions they should take and the prevention strategies that should be put into place.

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