

BMJ Open Prevalence of tobacco consumption among young physicians at a regional university hospital in southern Spain: a cross-sectional study

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ABSTRACT

Introduction The aim of the study is to analyse the prevalence of smoking among resident physicians at a regional university hospital. In addition, we examined the trends in the smoking behaviour of physicians in relation to results obtained in other studies carried out previously at this hospital, as well as those published nationally and internationally

Method A cross-sectional observational study evaluating tobacco consumption in young physicians was carried out at the level of secondary healthcare in a regional university hospital in Cordoba, Spain. All the study subjects were resident physicians who underwent a mandatory preliminary occupational health examination between 2012 and 2016. There was no sampling selection as anyone who took this examination was considered to be within the target population. We calculated the proportions of smokers, former smokers and non-smokers, with 95% CIs. Univariate and multivariate analyses (binary logistic regression) were used to analyse the results ($P < 0.05$).

Results The response rate was 99.4%, with a sample size of 324 out of a possible 326 physicians. The average age was 28.6 ± 3.7 —DT—(95% CI 28.2 to 29.0), and 62.3% (202/324; 95% CI 57.3 to 67.2) were women. Smoking prevalence was 6.5% (21/324; 95% CI 3.5 to 9.3) with a further 5.2% (17/324; 95% CI 2.7 to 7.8) being ex-smokers. There were no significant differences in the prevalence of tobacco consumption according to age ($P = 0.266$), sex (9.0% for men and 5.0% for women; $P = 0.128$), medical specialty ($P = 0.651$) or year of residency ($P = 0.975$). A 52.7% decline in the number of young physician smokers was noted between 1986 and 2016 (95% CI -44.0 to -63.5), together with a 64.4% increase in non-smokers (95% CI 55.2 to 77.3).

Conclusions We observed a significantly low prevalence of tobacco use among trainee physicians in the cohort, an effect of new antismoking laws, with positive role model implications for new physicians and medical students.

INTRODUCTION

The WHO considers smoking to be an epidemic and one of the main public health problems due to diseases, loss of life years and the deaths it causes, in addition to the

Strengths and limitations of this study

- The study shows the prevalence of smoking among young physicians, and provides relevant data on the evolution of tobacco consumption over the last 30 years.
- It is unlikely that there was a selection bias, given that the sample cohort includes all physicians residing in Spain, due to the obligatory occupational health examination required by law.
- There could be bias in the data gathered, as the information was self-reported and tobacco consumption may be underestimated.
- The study included predominantly young Spanish doctors, which may limit the generalisation of the results.

healthcare expense, involving an extra care load for health services.¹ In Spain, 55 000 people die every year as a consequence of tobacco, constituting 16% of all deaths in people aged over 35.²

A study reviewing articles published from 1974 to 2004 on tobacco consumption in the medical profession indicated the need for historic information and stressed how crucial it was that this consumption should decrease in the future.³ Spanish authors acknowledge that there is a lack of studies describing the temporal evolution of smoking over periods of more than 4 years.⁴

Doctors have been pioneers in the fight against smoking. In fact, Richard Doll, the acclaimed British physician who linked smoking to lung cancer, quit smoking after publishing his classic work on a cohort of doctors in the *British Medical Journal*.⁵ According to Smith and Leggat,³ the reduction in smoking is much faster among doctors than among other healthcare workers. It is therefore important to analyse how smoking has evolved in this collective, as their

consumption implies future trends in the general population.⁶ It is also an indicator of the impact that public health policies and campaigns have on smoking. Hence, there is a good reason for studying tobacco use trends among physicians, particularly the youngest. A paper written in 1986, from Reina Sofía University Hospital (Cordoba), indicated the need to implement efficient measures for dealing with tobacco consumption and assess the results in the medium to long term, as the majority of doctors who smoked stated their willingness to quit if provided with consistent and categorical measures.⁷

Recent publications from Spain have analysed the prevalence of smoking among hospital staff in Catalonia,⁶ as well as among resident physicians in Andalusia,^{8,9} and there are also longitudinal studies assessing tobacco consumption among health professionals in Catalonia⁴ and Madrid.¹⁰ However, more studies focusing on the prevalence in young physicians are needed.

Between the end of the 20th century and the beginning of the 21st, many laws have been developed to tackle smoking in Spain,¹¹ implying the need for indicators that evaluate the evolution and impact of these. In this sense, comparing smoking habits between physicians who trained before and after these antismoking laws were passed could be useful. The new generations of medical professionals have been trained alongside the implementation of plans and strategies for creating 'no smoking areas'.² One such example is the European Network of Smoke-free Hospitals (ENSH), whose work has provided interesting data that help us understand the impact on healthcare workers^{6,12} in general, but not specifically younger physicians. The terms 'residents', 'trainees' and 'resident physicians' in this paper refer to recent graduates from medical school who are licensed to practice medicine and who are undergoing training in a medical specialty. These tend to be younger than doctors who have already completed their residency.

The main objective of this paper is, therefore, to assess the prevalence of smoking among resident physicians at a regional university hospital, with the additional aim of analysing smoking trends in this population over a 30-year period (from 1986 to 2016).

METHODS

Study design and participants

An observational cross-sectional study was carried out to evaluate tobacco consumption in resident physicians (n=326) who underwent the mandatory¹³ preliminary occupational health examination, between 2012 and 2016, in a regional university hospital in Cordoba, Spain. Data were collected from the occupational health exam records. There was no sampling selection because all resident physicians who took the exam during this period were included. The only eligibility criterion was the fact of being a contracted resident in this hospital. We used the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines.¹⁴

Collected data

Data on tobacco consumption were analysed for all the trainees registered in Winmedtra,¹⁵ the software used in occupational health exams. This examination is mandatory according to current legislation,¹³ and takes place in the Occupational Health Unit of the hospital. Despite being mandatory, some data on tobacco consumption were missing because it was not properly recorded in the clinical history. In these cases, the information was completed through telephone interviews. Of the 326 registered residents, only two were not included in the study: one explicitly declined to participate in the research, and the other was in an external rotation and not able to answer the call. The response rate was therefore 99.41%.

The variables relating smoking habits were: consumption (smoker, former smoker or non-smoker); the year they started smoking (for smokers); and the dates they started and quit (for former smokers). Smokers were defined as those providing a positive response to the question, 'Do you smoke at least one cigarette per day?' The average daily consumption for smokers and former smokers was also included, and consumption was calculated in packs per year. The criteria defining smoker, former smoker and non-smoker were the same as used in previous studies analysing the trend.^{7,16} The database included information on gender, age, medical specialty and year of residency. The specialties were grouped into medical, surgical and diagnostic.

Data analysis

The variables gathered were analysed descriptively; central tendency and dispersion averages were calculated for the quantitative variables, while absolute and relative frequencies were calculated for the qualitative ones. Age was transformed into an ordinal qualitative variable, with two categories being erected: ages from 24 to 35, and from 36 to 49. To verify the existence of differences in tobacco consumption according to age, gender, medical specialty and year of residence, a bivariate analysis was performed, applying the U tests of Mann-Whitney, Kruskal-Wallis and Pearson's χ^2 . Subsequently, a multivariate analysis was run using multiple logistic regression and considering the status of smoker as the outcome variable. Age, gender, specialty and year of residence were included in the model as independent variables. The goodness of fit of the model was checked with the Hosmer-Lemeshow test. To compare current tobacco consumption with past levels in the same hospital (data published in 1988⁷ and 1996),¹⁶ differences of proportions were calculated, with a CI of 95%. Pearson's χ^2 test was used to compare the consumption trends and analyse the results of the 2016 study ($P \leq 0.05$). The SPSS V.17.0 and EPIDAT V.3.1 software packages were used for the statistical analysis.

This research study was conducted in accordance with the Helsinki Declaration¹⁷ and approved by the Cordoba Clinical Research Ethics Committee, respecting data protection laws.

**Table 1** Prevalence of smoking by age and sex

Category				Age (years)			X ² (P value)
				24–35	36–49	Total	
Non-smoker	Sex	Female	n (%)	178 (65.7)	6 (40.0)	184 (64.3)	3.712 (0.043)
		Male	n (%)	93 (34.3)	9 (60.0)	102 (35.7)	
	Total	n (%)	271 (100.0)	15 (100.0)	286 (100.0)		
Smoker	Sex	Female	n (%)	10 (50.0)	0 (0.0)	10 (47.6)	0.955 (0.329)
		Male	n (%)	10 (50.0)	1 (100.0)	11 (52.4)	
	Total	n (%)	20 (100.0)	1 (100.0)	21 (100.0)		
Former smoker	Sex	Female	n (%)	8 (47.1)	0 (0.0)	8 (47.1)	NC
		Male	n (%)	9 (52.9)	0 (0.0)	9 (52.9)	
	Total	n (%)	17 (100.0)	0 (0.0)	17 (100.0)		

NC, not calculable (no statistics are computed because age is a constant).

RESULTS

A total of 324 medical trainees were included in the study (response rate: 99.4%). 62.4% (242/388; 95% CI 57.3 to 67.2) were women and 37.6% (146/388; 95% CI 32.7 to 42.7) were men. The average age was 28.5±3.7—Typical Deviation (DT)—(95% CI 28.1 to 28.9; range: 24–49). Medical specialties were the most prominent (189/388; 48.8%), followed by surgical (126/388; 32.5%), with basic specialties (including non-clinical) being 14.2% (55/388).

Table 1 presents the smoking prevalence related to age and gender. 6.5% of respondents were smokers (21/324; 95% CI 3.5 to 9.3) and 5.2% (17/324; 95% CI 2.7 to 7.8) were former smokers. The average number of cigarettes smoked per day was 9.2±7.0 (95% CI 7.0 to 11.4); the accumulated average consumption was 4.8±5.0 packs/year (95% CI 3.2 to 6.4); and 7.0±3.6 smoking years (95% CI 5.1 to 8.9). Neither the univariate nor multivariate analyses showed significant differences in the prevalence of tobacco consumption according to age (P=0.266), gender (9.0% for men and 5.0% for women; P=0.128), medical specialty (P=0.651) or year of residency (P=0.975).

Analysing tobacco consumption with regard to medical specialty (**table 2**), it can be seen that the highest percentage of smokers were from the surgical specialty (10/110; 9.1%), and the lowest had no clinical

responsibilities (2/48; 4.2%); even so, the differences were not statistically significant (P=0.634). Despite this lack of significance, 100% of residents in smoking-related specialties, such as pneumology, were non-smokers (0/27).

Comparing the 2016 results with those of 1986 and 1992, in terms of category and gender (**table 3**), it can be seen that there has been a significant decrease in the prevalence of smoking among those trainees who previously considered themselves to be smokers. There also has been a decrease of 53.4% (95% CI –44.0 to –63.5) in smokers from 1986 to 2016, and an increase of 62.2% (95% CI 55.1 to 73.1) in non-smokers.

DISCUSSION

Doctors are a very influential group when it comes to social smoking-related changes, particularly their own smoking habits. Our study highlights the prevalence of smoking among young physicians who are undergoing training in a medical specialty in a hospital. As expected, the average age was low (28 years), there is a clear predominance of women (6 out of 10), which is in line with other studies.⁸ Additionally, this work provides interesting information on the trends in smoking over the last 30 years in the same hospital. Our study reveals an important decrease in the number of smokers among the physicians in the hospital compared with the figures from 1986, when more than half of the medical professionals smoked.⁷ Three decades later, fewer than 10% are smokers. This figure is close to that seen in countries which have been successful in the fight against smoking, such as the USA, the Netherlands and Scandinavian countries.³ A decade after the antismoking law was enacted and 5 years after it was amended, we can see that the prevalence of smoking is lower in young doctors than other physicians and healthcare professionals (**tables 4 and 5**).

The results illustrate the fact that young physicians are smoking less and less, confirming the trend seen in previous studies.^{3 10 16} The figures are very far from those

Table 2 Tobacco consumption in terms of medical specialty

Medical specialty of residents	Tobacco consumption			Total n (%)
	Non-smoker n (%)	Smoker n (%)	Former smoker n (%)	
Surgical	96 (87.3)	10 (9.1)	4 (3.6)	110 (100.0)
Medical	145 (87.9)	9 (5.5)	11 (6.7)	165 (100.0)
Diagnostic	44 (91.7)	2 (4.2)	2 (4.2)	48 (100.0)
Total	285 (88.5)	21 (6.5)	17 (5.2)	324 (100.0)

X²=4.313; P=0.634.

Table 3 Trends in the prevalence of smoking comparing the years 1986, 1992 and 2016, in terms of categories

Categories	1986 study ⁷	1992 study ¹⁶	2016 study	Difference* in years 1986–1992 % (95% CI)	Difference* in years 1992–2016 % (95% CI)	Difference* in years 1986–2016 % (95% CI)
	n=120 n (%)	n=219 n (%)	n=324 n (%)			
Smokers	72 (59.9)	106 (48.4)	21 (6.5)	-11.5 (0.0 to -23.0)	-41.9 (-34.7 to -49.6)	-53.4 (-44.0 to -63.5)
Former smokers	19 (16.0)	44 (20.1)	17 (5.2)	4.1 (-13.0 to 4.8)	-14.9 (-8.6 to -21.0)	-10.8 (-3.0 to -18.0)
Non-smokers	29 (24.1)	69 (31.5)	286 (88.3)	7.4 (-17.8 to 3.1)	56.8 (49.3 to 64.2)	62.2 (55.1 to 73.1)

*Difference in proportion for total data in each category.

of 1986, where almost 40% of physicians under the age of 35 smoked,¹⁸ even doing so in front of patients in medical consultations or in hospital wards.⁷ Fernández Ruiz and Bayle¹⁰ reported that the lowest prevalence of smoking corresponded to the group of physicians aged under 30. Other studies on residents^{8,9} indicate lower rates of smoking than in the general population as well as among doctors (table 4), especially with respect to regular smokers, with percentages similar to those obtained in our study.¹⁹ This tendency towards a reduction in smoking is also observed in the general population, although in this group the figures for daily smokers in the 24–35 age group are higher, especially among men.²⁰ According to Martínez and García,¹² smoking is less common among healthcare professionals than in the general population,

particularly in hospital physicians.⁶ Solano Reina *et al* pointed out that most pneumologists surveyed aged 25–34 had never been smokers,²¹ similar to the 87.9% among medical specialists seen in our study (table 2).

Generally speaking, most studies on tobacco consumption in physicians concur on the downturn in smoking habits, with the exception of one undertaken on the island of La Palma, Spain.²² In that article, the results may have been influenced by historical characteristics and local sociodemographics, as the author points out.

We can suggest some reasons for this progressive and meaningful decrease in smoking among young physicians. First, protective legislation in Spain¹¹ has been implemented: by comparing studies on healthcare providers from before^{4,7,10,16,18,23,24} and after^{4,6,8,19,22} the enactment of

Table 4 Comparison between the prevalence of smoking (smokers) obtained by other authors in studies on medical and health professionals in Spain since the enactment of antismoking legislation (1 January 2006) and its amendments (2 January 2011)

Study (main author)	Journal and/or publication and year	Kind of research and sample size (n)	Location	Total prevalence of active smoking		
				Men	Women	
Salamero ¹⁹	Study by Fundación Galatea, 2015 Baseline report, first year	Longitudinal by means of surveys, n=742 (baseline survey)	Multicentre in Spain (hospitals)	19.1% (9.1% daily and 10.0% occasional)	12.8% (6.3% daily and 6.5% occasional)	15.0% (7.0% habitual and 8.0% occasional)
Martínez ⁶	<i>Gac Sanit</i> , 2016	Meta-analysis of prevalence using surveys/n=1592	Hospitals in Catalonia	Medical professionals were not sorted by sex.	Medical professionals were not sorted by sex.	16.4%
Juárez-Jiménez ⁸	<i>Semergen</i> , 2015	Cross-sectional, by means of surveys in residents, n=2667 (including nursing residents)	Multicentre in Andalusia (hospitals and health centres)	20.0% (12.0% daily, 7.0% occasional and 1.0% social smokers)	17.0% (8.0% daily, 7.0% occasional and 2.0% social smokers)	17.0% (9.0% daily, 7.0% occasional and 1.0% social smokers)
Reyes Uruña ⁴	<i>Rev Esp Salud Pública</i> , 2013	Longitudinal by means of surveys n=90 in 2011	Catalonia healthcare centres	Medical professionals were not sorted by sex.	Medical professionals were not sorted by sex.	18.88% in 2011
Hernández Pérez ²²	<i>Med Gen y Fam</i> , 2015	Descriptive by means of surveys, n=101	Isla de La Palma Health area	Medical professionals were not sorted by sex.	Medical professionals were not sorted by sex.	29.0%

Range in the total prevalence of smoking from 15.0% to 29.0% (7.0% in habitual smokers for the lowest range). Average prevalence: 20.73% (19.25% in studies from after the amendment of the law in 2011).

**Table 5** Comparison between the prevalence of active smoking reported by other authors in studies on medical and health professionals in Spain with data from before the enactment of the antismoking laws (1 January 2006)

Study (main author)	Journal and year	Type of research and sample size (n)	Location	Men	Women	Total
Fernández Ruiz ¹⁰	<i>Gac Sanit</i> , 2003	Cross-sectional descriptive by means of surveys	Madrid region	This study only included women.	n=151 (34.71%) 1998 n=148 (37%) 2001	22.88% in <30 years 23.59% in <30 years
Reyes Uruña ⁴	<i>Rev Esp Salud Pública</i> , 2013 (data from 2001)	Longitudinal by means of surveys n=77 in 2001	Healthcare centres in Catalonia	Medical professionals were not sorted by sex.	Medical professionals were not sorted by sex.	25.97% in hospital workers, 2001
Santa-María ²⁴	<i>Med Preventiva</i> , 2005	Cross-sectional n=155 (physicians) n=23 (residents)	Madrid Hospital	27.7% (physicians)	33.9% (physicians)	29.9% (physicians) 39.1% (residents)
Diez Piña ²³	<i>Neumosur</i> , 2004	Descriptive by means of surveys n=52	Osuna Hospital	n=13 (25.0%)	n=4 (7.69%)	32.69% in hospital workers
Castanedo Saiz ¹⁸	<i>Aten Primaria</i> , 1987	Cross-sectional descriptive by means of surveys	Santander Hospital	49.50% (physicians) 48.71% (<30 years)	41.07% (physicians) 44.11% (<30 years)	47.58% (physicians)
Mengual Luque ¹⁶	<i>Gac Sanit</i> , 1996	Cross-sectional descriptive by means of surveys n=738 (physicians) n=104 (<30 years)	Cordoba Hospital	48.4% 42.9% (<30 years)	48.7% 46.3% (<30 years)	47.8% 44.2% (<30 years)
Martínez de la Iglesia ⁷	<i>Rev Clin Española</i> , 1987	Cross-sectional descriptive by means of surveys n=120 (physicians) n=48 (residents)	Cordoba Hospital	63.3% (60% daily smokers and 3.3% occasional)	43% (38.2% daily smokers and 4.8% occasional)	59.9% (physicians) 56.3% (residents)

Range in total prevalence of active smoking from 25.97% to 59.9% (63.3% in men). In doctors <30 years of age, ranging from 22.88% to 48.71%. Average prevalence of smoking in the articles: 49.83% in men, 42.55% in women and 45.8% total.

the antismoking law and its amendment,¹¹ we can verify that there has been a drop in the prevalence of smoking since this law took effect (table 4) compared with earlier figures (table 5). Indeed, most papers published after the amendment of this law reported a 20% drop in the numbers of smokers. It could be argued that those generations of medical professionals who have grown up and been trained while antismoking laws were in force display a lower rate of tobacco consumption, compared with those who trained before those laws came into effect. Some researchers^{20 25} suggest that public policies, through restrictive laws, are the main determinant in the sustained decrease in the smoking epidemic seen in both the general population and the occupational population,²⁶ as well as the decrease in exposure to environmental tobacco smoke,²⁷ although a 2009 study dismisses its impact in regard to the drop in consumption.²⁸ More than just restrictions, the law encourages the creation of non-smoking areas^{11 29} and programmes to help people quit smoking, which are usually part of national and regional health plans.² Second, and related to the former issue, training programmes, including medical^{30 31} and

nursing school courses, as well as other related study programmes, such as postgraduate work encompassing medical residencies, are of the utmost importance. Our hospital and the Family and Community Health Educational Unit systematically offer residents and their faculties training on behavioural changes (with emphasis on smoking), including sessions and workshops involving recommendations on this health problem postulated by preventative programmes which are very popular nationally (eg, PAPPs—the Programme of preventative and health promoting activities)³² or at a regional level (eg, PITA—the Comprehensive Anti-smoking Plan in Andalusia³). This same law¹¹ stressed the need to present content for smoking prevention and awareness raising in educational and training programmes, including university programmes, which is already incorporated into the third-year studies in our medical school in Cordoba. A study carried out with sixth-year medical students in Spain, in 2000, before the law took effect, showed that 18.3% of students smoked on a daily basis³³; this figure is close to that reported by Warren *et al* (20%) for third-year medical students³⁰ and lower than the prevalence

for current cigarette smoking reported by Barbouni *et al* (28.8%) for Greek medical students.³¹ Mas *et al*³³ refer to a decrease in smoking from the 1970s to the 1990s among medical students. It is logical that in addition to the law coming into force, medical studies in favour of quitting motivate students to make an effort to do so; at the very least this could partly explain why the majority of trainees now declare in the health exam that they have never smoked.

Other variables could play a role in this reduction in smoking. Workplace size seems to matter, as large companies enforce the law more than small ones.²⁵ The hospital in this study has more than 5000 employees.¹⁵ A recent study shows that Cordoba is the Andalusian province where the lowest number of resident physicians smoke.⁸ Culture and the preventive environment inside and outside the hospital could also influence this. Even more, the hospital in our study has a long-term cessation programme,¹⁵ responding to the challenge of going from the concept of a 'non-smoking building' to 'non-smoking premises' as a quality standard.²⁹ It also appears that hospitals taking part in the ENSH, like ours, achieve better results.^{4 12}

The strength of our study is its focus on young physicians. The fact that the youngest doctors are less likely to be smokers is not unimportant. They are the example for coming generations, making it more likely that the prevalence of smoking will continue to decrease among other staff in a snowball effect. They project a positive image, in particular to the users of the health system, as well as society in general. Even more importantly, these young doctors are also more effective in helping smokers who would like to quit, and training is crucial in this aspect.^{8 24 30 31} In addition, resident physicians are more predisposed to participate in smoking prevention activities.²¹

One possible selection bias could result from the fact that the doctors who are most likely to respond are those who are most aware of the problem. However, the target sample set comprises the majority of trainees in Spain, thanks to the mandatory occupational health exam required by law, and the response rate was high. There is also possible information bias in the data gathering process, with tobacco consumption likely to be underestimated, due to the self-reporting format. Although verbal declarations of tobacco consumption are considered reliable,³⁴ other studies involving objective methods would be useful, and further qualitative studies could help us understand in more detail the reasons for this prevalence decreasing. Finally, the study included mostly young Spanish doctors, which may limit the generalisation of the results.

In conclusion, this study demonstrates that the last three decades have seen an important decrease in the prevalence of smoking among resident physicians, particularly in young doctors. These figures point to the effectiveness of the implemented measures, whether in the form of legislation or training. Even so, challenges remain, such

as dealing with health providers and/or patients who fail to comply with the law, and accomplishing the complete eradication of smoking in medical environments and other public places.

Contributors ARS and LAPdT came up with and designed the study, in addition to gathering the data. LAPdT carried out the analysis of the data and ARS, LAPdT, RRM and FSL participated in the interpretation and discussion of the results. All the authors have taken part in writing this article and endorsed the final version for publication. The authors take responsibility for revising and deliberating all the aspects in this article as a team so that everything is expressed with the utmost accuracy and integrity.

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