Prevalence of poor sleep quality and associated lifestyle habits: A cross-sectional study in community pharmacies

Prevalencia de la mala calidad del sueño y hábitos de vida relacionados en farmacias comunitarias

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Conflicts of interest

The authors have no conflicts of interest to declare that are relevant to the content of this article

Resumen

Introducción: Muchos de los hábitos de vida pueden influir negativamente en la calidad de sueño (CS) y por lo tanto pueden desembocar en una mala calidad de vida. Por esa razón es importante determinar la prevalencia de mala CS en la población y qué hábitos de vida pueden estar relacionados con ella. De este modo se podrán diseñar intervenciones adecuadas que permitan mejorar la CS. El objetivo de este estudio fue estudiar la prevalencia de mala CS de la población de Salamanca (España) y su relación con ciertos hábitos de vida.

Método: Se estudió la CS de 261 pacientes mediante el "Pittsburg Sleep Quality Index" y se cuantificó la frecuencia con la que éstos realizaban una serie de hábitos de vida. La asociación entre variables se estudió mediante una regresión logística binaria multivariante.

Resultados: Casi la mitad de la población (48,7%) mostró tener mala CS. El ejercicio físico fue un factor protector para la mala CS (OR = 0,221; 95%CI: 0,081-0,603). Fueron factores de riesgo para la mala CS ser molestado por la noche (OR = 3,606; 95%CI: 1,892-6,872), ir a la cama preocupado (OR = 3,145; 95%CI: 1,528-6,471), leer cosas no transcendentales (OR = 2,475; 95%CI: 1,208-5,070), o jugar a videojuegos (OR = 3,639; 95%CI: 1,326-9,984).

Conclusiones: Casi la mitad de la población de estudio indicó padecer una mala CS en Salamanca (España). Pese a que muchos hábitos de vida están relacionados con la mala CS, solo se encontró relación estadísticamente significativa con algunos de ellos.

Palabras clave: Higiene del sueño; Calidad del sueño; Farmacia Comunitaria; hábitos de vida saludables; factores de riesgo; prevalencia.

Abstract

Introduction: Many lifestyle habits can negatively affect sleep quality (SQ) and lead to poor quality of life. This makes it important to determine the prevalence of poor SQ in the population and the lifestyle habits that may be associated with it, with a view to designing appropriate interventions for improving SQ. The aim of this study was to examine the prevalence of poor SQ among the population of Salamanca (Spain) and its relationship with specific lifestyle habits

Method: A cross-sectional study was carried out between July and November 2019. SQ was studied in 261 patients using the Pittsburgh Sleep Quality Index, and the frequency with which patients performed a series of lifestyle habits was quantified. The association between variables was assessed using multivariate binary logistic regression.

Results: Almost half of the study population (48.7%) was found to have poor SQ. Physical exercise was a protective factor against poor SQ (OR = 0.221; CI95%: 0.081-0.603). Risk factors for poor SQ included being disturbed at night (OR = 3.606; CI95%: 1.892-6.872), going to bed preoccupied (OR = 3.145; CI95%: 1.528-6.471), reading trivial material (OR = 2.475; CI95%: 1.208-5.070), and playing video games (OR = 3.639; CI95%: 1.326-9.984).

Conclusions: In Salamanca (Spain), almost half of the study population stated that they suffered poor SQ. Although numerous lifestyle habits that may relate to poor SQ were studied, a statistically significant relationship was only found for a few of them.

Keywords: Sleep Hygiene; Sleep Quality; Community Pharmacy; Healthy Lifestyle Prevalence; Risk Factors.

Highlights

Poor sleep quality is associated with a decrease in quality of life and a higher risk of suffering pathologies. Sleep hygiene habits are recommended based on their relationship with sleep quality but sometimes that intervention has no significant changes in sleep quality.

This article shows the prevalence of poor sleep quality and its association with lifestyle habits in a population recruited in community pharmacies, in Salamanca (Spain).

A real association is established between some lifestyle habits and subjective sleep quality. New strategies focused on certain habits could be developed thanks to this study.

Introduction

Disturbed sleep has been linked to cardiovascular and metabolic problems[1,2] and shown to have a negative effect on mental illnesses[3]. Its high prevalence generates considerable costs for health systems[4]. In Spain, at least 20% of the population suffer symptoms of insomnia 3 nights per week, with a higher prevalence among women (23.9%) than among men (17.6%)[5].

Subjective sleep quality (SQ) is the perception individuals have of how they sleep. It is based on a series of subjective evaluations by the patient and on objective sleep-related measurements. The latter include sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction[6-8]. To prevent poor SQ and its consequences, strategies other than the use of medication have been investigated (cognitive behavioral therapy, sleep hygiene, etc.). In the long term, these strategies appear to be preferable to hypnotics and have demonstrated patient improvement[9].

Peter Hauri coined the term "sleep hygiene" in 1977 in reference to habits, activities and practices (to encourage or avoid) that need to be considered for achieving adequate SQ[10]. Several studies have examined the effect of numerous lifestyle habits on improving SQ[6,11-13]. However, the sleep changes thus achieved are not always significant and improvement varies depending on the sleep component[14-15] and age[16,17].

Few studies on SQ in the population and the factors possibly associated with it have been conducted in Spain and, as far as we are aware, none has been conducted in the town of Salamanca.

The aim of this study was therefore to study the prevalence of poor SQ among the population of Salamanca and its association with specific lifestyle habits of its residents. In addition, given that many people regularly visit their community pharmacy, these establishments may be the ideal location for recruiting individuals who wish to participate in health-related studies. It is therefore of interest to see if this is the case.

Methods

Design and Participants

An observational, descriptive and cross-sectional study was carried out. It included patients over 18 years old who had visited any of 10 community pharmacies in the province of Salamanca between July and November 2019, for whatever reason. Patients who had problems communicating (language issues, deafness, speech impediments, etc.), those who had become parents in the preceding 6 months, and breastfeeding mothers were excluded from the study.

The sample was selected by means of consecutive sampling and sample size was calculated on the basis of simple random sampling, for an expected 20% prevalence of patients with poor SQ[5], with a 95% confidence interval (CI95%), 5% alpha error and 5% accuracy. With these conditions, the minimum sample size required was 246 individuals. Once the minimum sample size had been achieved, patient recruitment continued until the end of the planned recruitment period.

Main Outcomes

Sleep quality (SQ): SQ was analysed using the Pittsburgh Sleep Quality Index (PSQI)[18]. This is a questionnaire that evaluates subjective sleep quality in patients. It comprises 24 questions, 19 of which are posed directly to patients and 5 of which are posed to the patient's sleeping partner (the latter are not taken into account in this study). These questions shed light on 7 components of sleep quality: perceived sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. These 7 components are scored from 0 (not a problem at all) to 3 (a major problem). The final PSQI score thus ranges from 0 to 21. The index furthermore has a cut-off point that classifies patients as good sleepers (PSQI≤5) or poor sleepers (PSQI>5). The questionnaire was validated in Spain by Royuela et al. and demonstrated appropriate validity and reliability. Furthermore, for classification as good or poor sleepers by means of the cut-off point, a sensitivity value of

88.63%, a specificity value of 74.19%, a positive predictive value (PPV) of 73.58% and a negative predictive value (NPV) of 88.95% were obtained[19].

Lifestyle habits: participants were asked how frequently they performed specific lifestyle habits that may have a bearing on sleep quality (Table 1). Patients reply options were "Never", "Almost never" "Sometimes", "Almost always" and "Always". Subsequently, frequency was labelled as "Adequate" if the activity was performed "Never" or "Almost never", and as "Inadequate" if it was performed "Sometimes", "Almost always" or "Always".

Table 1. Lifestyle factors included in the study

Sleeping on an uncomfortable bed
Sleeping with an uncomfortable pillow
Correct bedroom temperature
Bedroom too bright
Being disturbed by something or someone while asleep
Looking at the clock at night when unable to sleep
Going to bed preoccupied
Using the bed for activities other than sleeping or having sex
Drinking coffee in the 4 hours before going to bed
Drinking alcohol in the 4 hours before going to bed
Going to bed hungry
Going to bed thirsty
Going to bed after a heavy supper
Daytime napping lasting more than one hour during the day
Getting up at the same time every day
Going to bed at the same time every night
Staying in bed after waking up
Working in bed before going to sleep
Taking exercise to the point of sweating in the 4 hours before going to bed
Doing enervating activities before going to sleep
Reading things that you consider important in bed
Reading things that you consider trivial in bed (books, magazines, etc.)
Texting on mobile phone in bed
Watching TV in bed
Listening to the radio/podcasts/music in bed
Playing videogames during the hour before going to sleep
Intense interaction on social media just before going to sleep
Lightweight interaction on social media just before going to sleep

Information was also collected regarding patient age, sex, education level, employment situation and whether they smoked. They were similarly asked if they slept alone or accompanied, and their height and weight were measured. They were asked whether they suffered any of the following conditions: diabetes mellitus, arterial hypertension, cancer, urinary incontinence, anxiety, or depression.

Data Analysis

To describe the sample, mean and standard deviation (SD) were used for the quantitative variables and frequency analysis for the qualitative variables. Differences in study variables depending on SQ (Good Sleeper/Poor Sleeper) were compared using the Chi square test or Fisher's exact test for qualitative variables, and Student's t-test for quantitative variables.

A multivariate binary logistic regression analysis was subsequently performed to examine the relationship between SQ and lifestyle habits. The Hosmer-Lemeshow test was used to determine goodness-of-

fit (calibration) of the model, and ROC AUC was used to determine the discrimination capacity of the model

Results

A total of 261 patients were included in the study. 58.6% were female and mean age was 54.8 (SD: 15.7) years old. Mean BMI was 25.6 (SD: 4.1) and 54.0% were overweight or obese (BMI≥25). Almost half (48.7%) of the study population were found to have poor SQ. As shown in Table 2, the mean PSQI score for good sleepers was 3.5 (SD: 3.9), and for poor sleepers 9.7 (SD: 3.2) (p<0.001). Table 3 shows sample distribution as regards PSQI components. Statistically significant differences between good and poor sleepers were found in all of them. Table 4 shows patient behaviour as regards the lifestyle habits studied.

Table 2. Sociodemographic characteristics of the population. Differences between Good and Poor Sleepers.

	Total N=261	Good Sleepers n=134 (51.3%)	Poor Sleepers n=127 (48.7%)	p-value
PSQI; mean (SD)	6.5 (3.9)	3.5(1.2)	9.7(3.2)	>0.001
Gender; n (%)				0.005
Male	108 (41.4)	63 (58.3)	45 (41.6)	
Female	153 (58.6)	71 (46.4)	82 (53.6)	
Age; mean (SD)	54.8 (15.7)	52.1 (15.3)	57.5 (16.6)	0.058
BMI; n (%)				0.264
<24.9	120 (46.0)	63 (52.5)	57 (47.5)	
25-29.9	105 (40.2)	57 (54.3)	48 (45.7)	
≥30	36 (13.8)	14 (38.9)	22 (61.1)	
Education level; n (%)				0.248
No education	15 (5.7)	6 (40)	9 (60)	
Primary	53 (20.3)	24 (45.3)	29 (54.7)	
Secondary	39 (14.9)	19 (48.3)	20 (51.2)	
'A' level / Vocational	44 (16.9)	29 (65.9)	15 (34.1)	
University	110 (42.1)	56 (50.9)	54 (49.1)	
Sleeps; n (%)				0.008
Alone	98 (37.5)	40 (40.8)	58 (59.2)	
Accompanied	163 (62.5)	94 (57.66)	69 (42.3)	
Employment situation; n (%)				0.025
Unemployed	22 (8.4)	11 (50)	11 (50)	
Working	152 (58.2)	86 (53.6)	66 (43.4)	
Student	9 (3.4)	7 (77.8)	2 (22.2)	
Retired	78 (29.9)	30 (38.5)	48 (61.5)	
Smoker; n (%)				0.593
No	258 (92.3)	132 (51.2)	126 (48.8)	
Yes	20 (7.7)	2 (66.7)	1 (33.3)	
Diabetes mellitus; n (%)				0.086
No	220 (84.3)	118 (53.6)	102 (46.4)	
Yes	41 (15.7)	16 (39)	25 (61)	
Arterial hypertension; n (%)				0.856
No	172 (65.9)	89 (51.7)	83 (48.3)	
Yes	89 (34.1)	45 (50.6)	44 (49.4)	
Cancer; n (%)				0.130
No	253 (65.9)	132 (52.2)	121 (47.8)	
Yes	89 (34.1)	2 (25)	6 (75)	
Urinary incontinence; n (%)				0.004
No	250 (95.8)	133 (53.2)	117 (46.8)	
Yes	11 (4.2)	1 (9.1)	10 (90.9)	

	Total N=261	Good Sleepers n=134 (51.3%)	Poor Sleepers n=127 (48.7%)	p-value
Anxiety; n (%)				<0.001
No	224 (85.8)	125 (55.8)	99 (44.2)	
Yes	37 (14.2)	9 (24.3)	28 (75.7)	
Depression; n (%)				0.014
No	241 (92.3)	129 (53.5)	112 (46.5)	
Yes	20 (7.7)	5 (25)	15 (75)	

PSQI: Pittsburgh Sleep Quality Index; SD: Standard Deviation; BMI: Body mass index.

Table 3. Characteristics of the sample according to the components of Sleep Quality.

PSQI Component	Total (n=261)	Good Sleepers n=134 (51.3%)	Poor Sleepers n=127 (48.7%)	p-value
Perceived Sleep Quality; n (%)				<0.001
Very good	46 (17.6)	39 (84.8)	7 (15.2)	
Fairly good	150 (57.5)	91 (60.7)	59 (39.3)	
Fairly bad	58 (22.2)	4 (6.9)	54 (42.5)	
Very bad	7 (2.7)	-	7 (5.5)	
Sleep Latency (minutes); n (%)				<0.001
< 15	54 (20.7)	38 (70.4)	16 (29.6)	
16-30	119 (45.6)	83 (69.7)	36 (30.3)	
31-60	57 (21.8)	12 (21.1)	45 (78.9)	
>60	31 (11.9)	1 (3.2)	30 (96.8)	
Sleep Duration; n (%)				<0.001
>7 hours	143 (54.8)	107 (74.8)	36 (25.2)	
6-7 hours	75 (28.7)	26 (34.7)	49 (65.3)	
5-6 hours	27 (10.3)	1 (3.7)	26 (96.3)	
<5 hours	16 (6.1)	0 (0)	16 (100)	
Sleep Efficiency; n (%)				<0.001
≥85%	165 (63.2)	120 (72.7)	45 (27.3)	
75-84%	48 (18.4)	14 (29.2)	34 (70.8)	
65-74%	20 (7.7)	0 (0)	20 (100)	
<65%	28 (10.7)	0 (0)	28 (100)	
Sleep Disturbances (PSQI score); n (%)				<0.001
0	4 (1.5)	4 (100)	0 (0)	
1-9	148 (56.7)	105 (70.9)	43 (29.1)	
10-18	98 (37.5)	25 (25.5)	73 (74.5)	
19-27	11 (4.2)	0 (0)	11 (100)	
Use of sleep medication; n (%)				<0.001
Not during the past month	191 (73.2)	128 (67.0)	63 (33.0)	
<1 time a week	13 (5.0)	2 (15.4)	11 (84.6)	
Once or twice a week	10 (3.8)	3 (30)	7 (70.0)	
≥3 times a week	47 (18.0)	1 (2.1)	46 (97.9)	
Daytime dysfunction; n (%)				<0.001
Not a problem at all	128 (49.0)	90 (70.3)	38 (29.7)	
A very minor problem	90 (34.5)	40 (44.4)	50 (55.6)	
Something of a problem	36 (13.8)	4 (11.1)	32 (88.9)	
A major problem	7 (2.7)	0 (0)	7 (100)	

PSQI: Pittsburgh Sleep Quality Index.

Table 4. Frequency of lifestyle habits among sample patients (n=261).

How often…	ADEQUATE		INADEQUATE		
	N; n (%)	AN; n (%)	S; n (%)	AA; n (%)	A; n (%)
do you find your bed uncomfortable?	134 (51.3)	71 (27.2)	50 (19.2)	4 (1.5)	2 (0.8)
do you find your pillow uncomfortable?	108 (41.4)	70 (26.8)	70 (26.8)	10 (3.8)	3 (1.1)
do you find that the temperature in your bedroom is not appropriate?	78 (29.9)	72 (27.6)	98 (37.5)	12 (4.6)	1 (0.4)
do you sleep somewhere where there is too much light?	164 (62.8)	69 (26.4)	23 (8.8)	3 (1.1)	2 (0.8)
are you disturbed while sleeping?	86 (33.0)	55 (21.1)	66 (25.3)	29 (11.1)	25 (9.6)
do you look at the clock when unable to sleep?	61 (23.4)	59 (22.6)	84 (32.2)	26 (10.0)	31 (11.9)
do you go to bed worrying about something?	35 (13.4)	38 (14.6)	117 (44.8)	48 (18.4)	23 (8.8)
do you use your bed for activities other than sleeping or having sex?	174 (66.7)	30 (11.5)	38 (14.6)	10 (3.8)	9 (3.4)
do you drink coffee in the 4 hours before going to bed?	188 (72.0)	39 (14.9)	28 (10.7)	3 (1.1)	3 (1.1)
do you drink 2 or more glasses of wine/beer in the 4 hours before going to bed?	167 (64.0)	42 (16.1)	44 (16.9)	7 (2.7)	1 (0.4)
do you drink spirits or a shot in the 4 hours before going to bed?	194 (74.3)	48 (18.4)	18 (6.9)	-	1 (0.4)
do you go to bed hungry?	186 (71.3)	55 (21.1)	19 (7.3)	-	1 (0.4)
do you go to bed thirsty?	186 (71.3)	59 (22.6)	13 (5.0)	1 (0.4)	2 (0.8)
do you feel too full after supper before going to sleep (heavy evening meal)?	132 (50.6)	72 (27.6)	51 (19.5)	4 (1.5)	2 (0.8)
do you nap for longer than 1 hour?	104 (39.8)	66 (25.3)	71 (27.2)	11 (4.2)	9 (3.4)
do you get up at the same time every day?	7 (2.7)	9 (3.4)	35 (13.4)	159 (60.9)	51 (19.5)
do you go to bed at the same time every night?	5 (1.9)	17 (6.5)	45 (17.5)	175 (67.0)	19 (7.3)
do you stay in bed after waking up?	60 (23.0)	70 (26.8)	75 (28.7)	34 (13.0)	22 (8.4)
do you work in bed before going to sleep?	221 (84.7)	15 (5.7)	20 (7.7)	4 (1.5)	1 (0.4)
do you take exercise to the point of sweating in the 4 hours before going to bed?	186 (71.3)	33 (13.6)	28 (10.7)	10 (3.8)	4 (1.5)
do you do enervating activities before going to sleep?	135 (51.7)	69 (26.4)	49 (18.8)	8 (3.1)	-
do you read things that you consider important in bed?	138 (52.9)	44 (16.9)	60 (23.0)	10 (3.8)	9 (3.4)
do you read things that you consider trivial in bed?	138 (52.8)	39 (14.9)	64 (24.5)	16 (6.1)	4 (1.5)
do you text on your mobile in bed?	141 (54.0)	31 (11.9)	48 (18.4)	23 (8.8)	18 (6.9)
do you watch TV in bed?	176 (67.4)	23 (8.8)	32 (12.3)	17 (6.5)	13 (5.0)
do you listen to the radio/podcasts/music in bed?	142 (54.4)	24 (9.2)	54 (20.7)	16 (6.1)	25 (9.6)
do you play video games in the hour before going to sleep?	216 (82.8)	14 (5.4)	17 (6.5)	10 (3.8)	4 (1.5)
do you have intense interaction on social media just before going to sleep?	166 (63.6)	31 (11.9)	41 (15.7)	14 (5.4)	9 (3.4)
do you use social media for trivial activities just before going to sleep?	151 (57.9)	31 (11.9)	54 (20.7)	21 (8.0)	4 (1.5)

N: Never; AN: Almost never; S: Sometimes; AA: Almost always; A: Always.

The multivariate analysis revealed a statistically significant relationship between being a "poor sleeper" and age (OR=1.032; CI95%:1.003-1.061), but the relationship between SQ and sex was not found to be significant. Patients who slept accompanied had a 52.1% lower risk of being a "poor sleeper" than patients who slept alone (OR=0.479; CI95%: 0.255-0.901). As regards comorbidities among patients, those with urinary incontinence were at 20 times higher risk of being a "poor sleeper" than patients not affected by this condition (OR=20.001; CI95%:2.055-194.771), and the risk for patients suffering anxiety was 3.950 times higher than for patients not affected by this condition (OR: 3.950; CI95%:1.585-9.840). Patients with diabetes mellitus had a 3.405 times higher risk than non-diabetic patients (OR: 3.405; CI95%: 1.347-8.607). Arterial hypertension and drinking coffee were not found to be risk factors (OR = 0.535; CI95%: 0.234-1.226 and OR = 0.406; CI95%: 0.149-1.107 respectively); they were however kept in the final multivariate analysis to serve as confounding variables. The other comorbidities among patients showed no statistically significant relationship with SQ. Physical exercise was a protective factor against poor SQ (OR = 0.221; CI95%: 0.081-0.603) and risk factors for poor SQ were being disturbed at night (OR = 3.606; CI95%: 1.892-6.872), going to bed preoccupied (OR = 3.145; CI95%: 1.528-6.471), reading trivial material (OR = 2.475; CI95%: 1.208-5.070), and playing video games (OR = 3.639; CI95%: 1.326-9.984). The Hosmer-Lemeshow value for this model was 4.682 (p=0.791) and AUC was 0.829 (CI95%: 0.780-0.879) (Table 5).

Table 5. Association between Sleep Quality and patient frequency of lifestyle habits.

	Raw OR	CI95%	Corrected OR	CI95%
Gender			-	-
Male	1			
Female	1.617	0.983-2.659		
Age	1.023	1.006-1.040	1.032	1.003-1.061
BMI			-	-
>25	1			
>30	0.931	0.551-1.574		
≤30	1.737	0.821-3.713		
Education level			-	-
No education	1			
Prim/Sec	0.760	0.250-2.308		
'A' / VT / University	0.541	0.184-1.595		
Sleeps				
Alone	1		1	
Accompanied	0.506	0.304-0.842	0.479	0.255-0.901
Employment situation			-	-
Unemployed	1			
Working	0.767	0.314-1.878		
Student	0.286	0.048-1.694		
Retired	1.600	0.617-4.146		
Smoker			-	-
No	1			
Yes	0.524	0.047-5.849		
Diabetes mellitus				
No	1		1	
Yes	1.808	0.915-3.572	3.405	1.347-8.607
AH				
No	1		1	
Yes	1.048	0.628-1.749	0.535	0.234-1.226
Cancer			-	-
No	1			
Yes	3.273	0.648-16.524		

	Raw OR	CI95%	Corrected OR	CI95%
Urinary incontinence				
No	1		1	
Yes	0.088	0.011-0.698	20.004	2.055-194.771
Anxiety				
No	1		1	
Yes	3.928	1.772-8.707	3.950	1.585-9.840
Depression			-	-
No	1			
Yes	3.455	1.217-9.808		
Uncomfortable bed			-	-
No	1			
Yes	1.861	1.019-3.400		
Uncomfortable pillow			-	-
No	1			
Yes	1.848	1.089-3.134		
Correct temperature			-	-
No	1			
Yes	1.285	0.786-2.101		
Light			-	-
No	1			
Yes	0.770	0.349-1.698		
Disturbed				
No	1		1	
Yes	3.048	1.838-5.055	3.606	1.892-6.872
Clock			-	-
No	1			
Yes	2.472	1.499-4.077		
Preoccupied				
No	1		1	
Yes	3.501	1.941-6.314	3.145	1.528-6.471
Sex			-	-
No	1			
Yes	1.469	0.813-2.652		
Caffeine				
No	1		1	
Yes	0.279	0.121-0.643	0.406	0.149-1.107
Wine			-	-
No	1			
Yes	0.726	0.393-1.341		
Spirits			-	-
No	1			
Yes	0.593	0.226-1.558		
Herbal medicines			-	-
No	1			
Yes	3.192	1.470-6.930		
Hungry			-	-
No				
Yes	1.643	0.649-4.164		
Thirsty			-	-
No	1			
Yes	2.447	0.825-7.251		
Heavy evening meal			-	-
No	1			
Yes	1.341	0.744-2.418		

	Raw OR	CI95%	Corrected OR	CI95%
Naps			-	-
No	1			
Yes	0.609	0.364-1.020		
Time getting up			-	-
No	1			
Yes	1.626	0.573-4.613		
Time going to bed			-	-
No	1			
Yes	1.409	0.580-3.420		
Staying in bed			-	-
No	1			
Yes	1.564	0.959-2.549		
Working in bed			-	-
No	1			
Yes	1.661	0.717-3.847		
Physical exercise				
No	1		1	
Yes	0.413	0.204-0.836	0.221	0.081-0.603
Enervating activities			-	-
No	1			
Yes	0.855	0.475-1.542		
Trivial reading			-	-
No	1			
Yes	1.614	0.948-2.749		
Important reading				
No	1		1	
Yes	1.654	0.979-2.793	2.475	1.208-5.070
Use mobile			-	-
No	1			
Yes	1.202	0.720-2.006		
TV			-	-
No	1			
Yes	0.986	0.557-1.744		
Radio			-	-
No	1			
Yes	1.202	0.725-1.991		
Video games				
No	1		1	
Yes	1.537	0.720-3.283	3.639	1.326-9.984
Social networks interaction			-	-
No	1			
Yes	0.837	0.475-1.474		
Social networks no interaction			-	-
No	1			
Yes	0.901	0.531-1.528		

BMI: Body Mass Index; 'A': 'A' level, VT: Vocational Training. Hosmer–Lemeshow test: 4.682 (p=0.791); Cox & Snell R^2= 0.311; Nagelkerke R^2 = 0.415; AUC: 0.829 (CI95%: 0.780-0.879)

Discussion

One of the questions that this study aimed to clarify was whether community pharmacies may be an appropriate place to make assessments. The short period of time required to recruit the sample size,

the large number of pharmacies and their distribution across the region, pharmacist training and patient trust in their pharmacist make community pharmacies an ideal place for conducting epidemiological studies, such as research into SQ, that require a large proportion of the population to be recruited without investing major effort.

This study revealed a high prevalence of patients with poor SQ (48.7%) among the population of Salamanca. Prevalence is higher than that found in other studies carried out in Spain using the same SQ measurement method (PSQI)[16,20]. However, these studies were conducted in other areas of the country, and it was not possible to establish the reasons for this difference in prevalence.

There are, unsurprisingly, considerable differences in the SQ dimensions measured using PSQI. Good sleepers perceived their sleep as "fairly good" or "very good", whilst poor sleepers perceived it as "fairly poor" or "very poor". Similarly, better values for sleep latency, sleep duration and sleep efficiency were obtained among good sleepers than among poor sleepers. Poor sleepers experienced more sleep disturbances, more daytime dysfunction and took more sleep medication. In this last respect, a comment must be made here: it is logical to think that patients who needed medication were those who had problems sleeping. However, after one month (the period over which SQ was measured using PSQI), patients taking such medication continued to report that they were suffering poor SQ. It may therefore be stated that the therapeutic strategy prescribed for treating sleep issues was ineffective, and that the pharmacist should have suggested that the patient saw their general practitioner for treatment review[21].

Madrid-Valero et al. found significant differences in SQ in the Spanish population depending on age and gender[16]. These results match those found in this study as regards age, but not gender. Gender-related differences may have been eclipsed in the multivariate analysis by the effect of other study variables, because the bivariate analysis (Table 1) shows a clear difference in SQ according to gender.

Caffeine is widely consumed around the world. Yet despite this, evidence of the extent to which it affects sleep is not clear and depends on the amount of caffeine consumed and the tolerance and sensitivity of the person consuming it. Although high doses (several cups of coffee) shortly before going to bed may hinder sleep, there is no evidence in the non-clinical population that low or moderate consumption hinders sleep[22]. This may account for why, in this study, no statistically significant relationship is found between SQ and consuming caffeine a few hours prior to going to bed. In any case, this variable is shown to be a confounding variable in the presence of AH, and for this reason it was kept in the logistic model.

By contrast, the consumption of high doses of nicotine whether in the form of cigarettes, tablets or patches has been associated with sleep disorders[23]. However, the acute nervousness caused by stopping smoking has negative effects on sleep and, in the long term, there is no evidence that stopping smoking is beneficial for improving SQ[22]. Our study found no correlation between SQ and tobacco consumption. This could be explained by the low number of smokers in the study sample. Given that there are increasingly fewer smokers in Spain[24], this may become a fairly insignificant risk factor in the near future.

The consumption of alcohol has also been shown to cause sleep disturbances, and recommendations range from avoiding high consumption of alcohol to not drinking at all before going to bed[10]. In addition, subsequent studies found that in people who are not alcohol-dependent, drinking alcohol (even a small amount) before going to bed may affect their sleep that night, although this will also depend on individual tolerance[22]. The majority of the study population either do not drink alcohol at all or only very occasionally, and therefore although they might experience poor sleep on a given night, this does not appear to be sufficient reason for them to describe their SQ as poor over the preceding month. This would account for the fact that the questions relating to alcohol consumption in this study show no relationship with SQ.

Another lifestyle habit highly recommended for improving SQ is physical exercise, although it should not be taken too near bedtime[10]. However, more recent pieces of research agree that physical exercise improves SQ[20], even when taken shortly before going to bed[22]. It has also been shown to improve SQ

in insomnia patients[25]. In our initial hypothesis, we posited that exercise was a predictive factor for SQ, and in this respect the results obtained matched the data expected.

Naps have been widely studied in scientific literature as having a possible effect on sleep, although there does not seem to be any clear link between daytime napping and broken nights[22]. The data obtained in this study support this observation. It must nevertheless be borne in mind that the question was framed in terms of naps lasting longer than one hour, so this result must be interpreted with caution.

Another of the most widely-made recommendations for achieving good SQ was to reduce stress levels before going to sleep, which is why individuals are encouraged not to do any activities that make them nervous or worried, but rather some kind of relaxing activity before going to bed[10]. Stress has indeed been found to cause problems getting to sleep and staying asleep[26]. This is why study participants were asked about activities such as reading things that they found important or not, watching TV, listening to the radio, etc. All such activities may favour or hinder proper sleep. Listening to relaxing music does not have the same effect as watching a football match. In any case, most of these activities were found not to have any relationship with SQ in this study, not even those relating to use of new technologies. This may be due to the highly general nature of the questions, which allowed subjects to use their own judgement when interpreting what they considered important or stressful. On the other hand, very few participants stated that they did these types of activities, which made it difficult to determine whether their effects on SQ were significant. Only playing video games and reading material that the participant considered trivial were found to be risk factors for poor SQ.

In addition to the foregoing, new technologies must be considered today. Their negative effect on SQ has not been clearly demonstrated[27]. It must be emphasised that the majority of research looking at the use of technology and its relationship with sleep only analyses how often it is used before going to sleep[27], not why it is used[28]. This study investigated the frequency and intensity of technology use-related activities but even so, in our model only playing video games was found to have a significant bearing on SQ. Playing video games before going to sleep appear to cause a state of excitation not conducive to sleep; this might not be caused by other activities such as reading emails or news on social networks. However, the study by Carter et al[29] showed that the use of technology among children and young people did have a considerable bearing. This fact was perhaps not observed in our study given the different age of the study population.

Several limitations must be considered for our study results to be correctly interpreted. Firstly, it must be borne in mind that given the type of study design used (cross-sectional), no causal relationship can be established between the variables analysed and poor SQ. However, the results do provide an overview of the current situation with regard to SQ in the population of Salamanca. It would be of interest to conduct prospective studies that enable causal relationships between lifestyle habits and poor SQ to be identified. Secondly, conducting this study in community pharmacies entails a potential selection bias, since people who visit such establishments usually have health issue; only in a few cases was this not so. Caution must therefore be exercised when extrapolating results.

In future research, it may be of interest to conduct longitudinal studies that enable causal relationships to be identified between specific lifestyle habits and poor SQ. Moreover, studying each lifestyle habit separately as regards time of day, frequency and intensity and comparing between groups may well clear up many of the existing doubts surrounding the lifestyle habits mentioned and poor SQ. This study shows that SQ can be assessed in community pharmacies. However, further research is needed to explore whether pharmaceutical interventions can improve SQ in the population.

Conclusion

Studying SQ was considered important because it is a factor that directly affects quality of life among the population. In the Spanish town of Salamanca, almost half of the study population stated that they suffered poor SQ. Although numerous lifestyle habits that may relate to poor SQ were studied, a statistically significant relationship was only found for a few of them. It was shown that physical exercise is

a factor that protects against poor SQ, and being disturbed at night, going to bed preoccupied, reading trivial material and playing video games were risk factors for poor SQ. Other risk factors identified were Type II diabetes, anxiety and urinary incontinence. This notwithstanding, other studies with more tailored designs are required to demonstrate causality between the predictive variables analysed and SQ. In addition, community pharmacies appear to be a suitable place for conducting these types of study, given that they are found all over Spain and the people visiting them are willing to participate in activities suggested by their pharmacist.

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