Detection of alcohol use disorders using the camouflaged CAGE questionnaire in three population groups

Detección de trastornos por uso de alcohol mediante la aplicación del cuestionario CAGE camuflado en tres grupos poblacionales

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Abstract

The objective was to evaluate the risk of presenting an alcohol use disorder (AUD) in outpatient psychiatric units and compare it with drug addiction outpatient units and with healthy controls in the same administrative health area. An observational, descriptive, multicenter study was carried out in which a total of 1054 participants were evaluated. Data were obtained by means of the camouflaged CAGE questionnaire, which consists of 4 basic questions camouflaged with 8 other questions about healthy lifestyle habits. Cut-off points 1 and 2 were considered.

Of the total number of participants, 588 were psychiatric outpatients, 153 outpatients from addiction centers and 313 healthy individuals. The mean age of the total sample was 45.8 years and the percentage of men was 53.2%. Of the total sample, 38.3% scored ≥1, as did 34.2% of psychiatric patients, 72.5% of drug addicts and 29.4% of healthy people. The ≥2 cut-off was reached by 26.6% of the total sample, 22.6% of psychiatric patients, 64.7% of drug addicts and 15.3% of healthy subjects. The participants with the highest percentage of ≥1 scores were men (48.8%), those younger than 30 years (50%), those with a diagnosis of alcohol use disorder (95.9%) and ADHD (83.3%). Psychiatric patients are at a higher risk of having an AUD than the healthy subjects, although lower than those who are drug addicts, and the CAGE questionnaire is a simple and useful tool to detect the risk patients have to suffer the condition under study.

Keywords: Alcohol use disorder; CAGE questionnaire; Drug dependent outpatients; Dual pathology; Psychiatric outpatients.

Resumen

El objetivo fue evaluar el riesgo de presentar un trastorno por uso de alcohol (TUA) en las consultas psiquiátricas ambulatorias y compararlo con las consultas de drogodependencias y con individuos sanos de la misma zona de salud. Se realizó un estudio observacional, descriptivo, multicéntrico, en el que fueron incluidos un total de 1054 participantes. Se utilizó el cuestionario CAGE camuflado para la obtención de los datos, que consta de 4 preguntas básicas camufladas con otras 8 preguntas sobre hábitos de vida saludables. Se consideraron los puntos de corte de 1 y 2.

Del total de participantes, 588 eran pacientes psiquiátricos ambulatorios, 153 de los centros de drogodependencias ambulatorios y 313 sanos. La edad media de la muestra fue de 45,8 años y el porcentaje de hombres fue del 53,2%. El 38,3% de los participantes presentaron una puntuación ≥1, el 34,2% en las consultas psiquiátricas, el 72,5% en las de drogodependencias y el 29,4% en sanos. El 26,6% presentaron una puntuación ≥2, el 22,6% en las consultas psiquiátricas, el 64,7% en las de drogodependencias y el 15,3% en sanos. Los que presentaron mayor porcentaje de puntuación ≥1 fueron los hombres (48,8%), los menores de 30 años (50%), y los que tenían un diagnóstico de trastorno por uso de alcohol (95,9%) y de TDAH (83,3%).

Los pacientes psiquiátricos presentan un mayor riesgo de presentar un TUA que los individuos sanos, aunque menor que los drogodependientes, siendo el cuestionario CAGE una herramienta sencilla y útil para detectar el riesgo de presentarlos.

Palabras clave: Trastornos por uso de alcohol; Cuestionario CAGE; Pacientes drogodependientes ambulatorios; Patología dual; Pacientes psiquiátricos ambulatorios.

Alcohol is one of the main preventable causes of premature mortality, illness and disability. It is the most widely used psychoactive drug in Spain (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2017), where it also presents a significant burden of death and disease. Ten percent of the total mortality of the population aged 15 to 64 in 2011 was potentially attributable to alcohol, mostly due to habitual excessive use, with the probability of death or alcohol-related harm being much higher in men than in women (Pulido et al., 2014). Currently, the total social cost of alcohol consumption in Spain may be around 1% of GDP (more than €10,000 million) (Rehm, Rehm, Shield, Gmel & Gual, 2013).

In Spain, no clear data on the prevalence of alcohol use disorders (AUD) are available. A prevalence of between 4.0% and 8.7% of the general population screening positive was obtained in different studies carried out in different Spanish autonomous communities between 1992 and 2010 using the CAGE questionnaire with a cut-off point ≥ 2 (Alvarez & del Rio, 1994; Alvarez, Fierro & del Rio, 2006; Anitua, Aizpuru & Sanzo, 1998; Dirección General de Atención Primaria, 2001; Dirección General de Atención Primaria, 2006; Dirección General de Atención Primaria, 2011; Pérez et al., 2010; Servicio de Estudios e Investigación Sanitaria, 2004); this prevalence ranged in men from 6.1% to 13.6% and in women from 1.2% to 5.3%. Using the AUDIT test (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2017), 5.1% of Spaniards aged 15 to 64 were classified in the high-risk alcohol use group (7.6% of men and 2.6% of women) and 0.2% as having a possible addiction (0.3% of men and 0.1% of women). In the 2015 EDADES survey (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2015), the proportion of those with high-risk consumption was 5% of Spaniards aged 15 to 64 (5.8% of men and 4% of women), this time the criterion being the amount of alcohol drunk per week.

Users of other substances have higher alcohol consumption than the general population. Among smokers, 84.3% had drunk alcohol in the last 12 months, a figure which rose to 91.7% in users of cannabis, 94.4% in cocaine and 96.3% in ecstasy users (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2017). Patients with alcohol abuse/addiction also frequently use other psychoactive drugs and suffer from other mental health disorders with a high prevalence (Gual A, 2007; Segui et al, 2001).

Psychiatric patients also present a higher frequency of toxic consumption than the general population, with the psychiatric population observed as having a risk twice as high of presenting an AUD than the general population (Mansell, Spiro, Lee & Kazis, 2006; Regier et al., 1990). Patients with dual pathology are those who simultaneously suffer from a psychiatric illness and a substance abuse disorder, such as AUD itself (Luoto, Koivukangas, Lassila

& Kampman, 2016; Sánchez-Autet et al., 2018; Torrens, Mestre-Pintó, Montanari, Vicente & Domingo-Salvany, 2017). These patients with mental disorder and an AUD have worse treatment adherence, worse prognosis, worse quality of life, more social complications, higher suicide rates and longer hospital stays; this has been observed in almost all mental illnesses such as anxiety (Vorspan, Mehtelli, Dupuy, Bloch & Lépine, 2015), depression (Sullivan, Fiellin & O'Connor, 2005; Worthington et al., 1996), bipolar disorder (Coryell et al., 1998; Feinman & Dunner, 1996; Sonne, Brady & Morton, 1994; Winokur et al., 1998; Zamora-Rodríguez, Sánchez-Waisen, Guisado & Vaz, 2018) and schizophrenia (Soyka, Albus, Immler, Kathmann & Hippius, 2001; Urbanoski, Cairney, Adlaf & Rush, 2007).

Different questionnaires for detecting AUD or high-risk drinkers are available, the most commonly used being AUDIT (Alcohol Use Disorders Identification Test; Saunders, Aasland, Babor, de la Fuente & Grant, 1993) and CAGE (Fiellin, Reid & O'Connor, 2000). AUDIT was more effective in identifying subjects with risky or dangerous consumption (sensitivity, 51%-97%; specificity, 78%-96%), while the CAGE questionnaire was superior in detecting alcohol abuse and dependence (sensitivity, 43%-94%; specificity, 70%-97%) (Fiellin et al., 2000).

The CAGE questionnaire is an instrument for detecting alcohol use disorders which is simple, brief and easy to apply. It was developed by Ewing (1984) and validated by Mayfield, McLeod and Hall (1974). It consists of four questions regarding alcohol use. In general, the greater the number of affirmative answers, the more serious the dependency (Ewing, 1984; Malet, Schwan, Boussiron, Aublet-Cuvelier & Llorca, 2005; O'Brien, 2008).

The "camouflaged" CAGE questionnaire was developed to make the interview less intimidating (Castells & Furlanetto, 2005; Masur, Capriglione, Monteiro & Jorge, 1985). The four questions of the original CAGE are mixed with eight further questions about healthy lifestyle habits. Although they lack discriminatory value, these intermediate questions are useful in introducing the topic of alcohol use, thereby, as already mentioned, making the interview less intimidating for the interviewee.

Regarding scoring and the most appropriate cut-off point in the CAGE questionnaire, there is some controversy about whether this should be 1 or 2 positive responses (Sánchez-Autet et al., 2018) since this could affect both its sensitivity and its diagnostic specificity. We found studies in favor of using ≥ 1 positive response as the cut-off point (Agabio, Marras, Gessa & Carpiniello, 2007; Bradley, Bush, McDonell, Malone & Fihn, 1998; Bush, Shaw, Cleary, Delbanco & Aronson, 1987; Liskow, Campbell, Nickel & Powell, 1995), while others argue that the most appropriate cut-off is ≥ 2 positive responses (Castells et al., 2005; Fiellin et al., 2000; Hearne, Connolly & Sheehan, 2002; Mayfield et al., 1974; Paz Filho et al., 2001). It has been estimated that

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the sensitivity and general specificity for clinical populations of the CAGE questionnaire is 71% and 90% respectively (Dhalla & Kopec, 2007; Mitchell, Bird, Rizzo, Hussain & Meader, 2014). A cut-off point of 1 seems to provide high sensitivity at the same time as maintaining sufficient specificity, while, despite implying lower sensitivity, a cut-off point of 2 does improve specificity (Corradi-Webster, Laprega & Furtado, 2005; Dervaux et al., 2006).

In the first part of our study (Sánchez-Autet et al., 2018), in which we analyzed the prevalence of AUD in outpatient psychiatric patients with a modified CAGE, we found that the male patients with bipolar or personality disorder presented a higher risk of AUD.

The objectives of our study were: 1) to obtain the prevalence of AUD in outpatient psychiatric services, in outpatient drug addiction centers and in a sample of healthy subjects by using the camouflaged CAGE questionnaire; 2) to compare the prevalence of the three samples; 3) to analyze the impact of rurality, a variable not used in the previous literature, on the results obtained.

Material and methods

Recruitment of participants

An observational, descriptive and multicenter study was carried out. The sample was obtained from different outpatient services in Spain in the Autonomous Community of Extremadura (provinces of Badajoz and Cáceres) and the Autonomous Community of Catalonia (only the province of Barcelona); a total of 30 outpatient psychiatrists and 10 doctors from drug addiction centers participated in data collection.

The methodology was the same as in the previous study published by our group (Sánchez-Autet et al., 2018), but in this second part, data were collected for three groups of participants: patients who were being treated by their outpatient mental health unit, as in the initial study, plus those who we could not include in the first analysis, patients who were being treated in their outpatient drug addiction center and healthy subjects. The sample of outpatient drug addicts could only be obtained from the Autonomous Community of Extremadura.

The inclusion criteria were: aged 18 years of age or over, having the cognitive ability to answer the questionnaire (at the discretion of the interviewer), and giving their consent to participate in the study. For the control group of healthy subjects, those with a personal history of having received any type of pharmacological or psychotherapeutic treatment by mental health or drug centers were excluded, although other medical illnesses were accepted.

Patients were included consecutively as they arrived at their treatment center, both at the outpatient mental health unit and their outpatient drug addiction service, depending on their diagnosis, and provided they met the inclusion criteria. The sample of healthy subjects was obtained from health workers, family members and other people in the researchers' environment. All participants gave their written consent. The study was approved by the different local ethics committees.

Study design

The recruitment period was from May 2015 to August 2015 for the sample from outpatient mental health and drug addiction centers, extended until December of the same year for the collection of the sample of healthy subjects. All procedures performed for this study were carried out in a single visit within the usual care provided for these patients and by specifically contacting healthy controls for a study visit. After signing written consent, sociodemographic data (age and sex) were collected and the patient's diagnosis was recorded, based on DSM-V criteria (Diagnostic and Statistical Manual of Mental Disorders, 5th ed.) (American Psychiatric Association, 2013). The "camouflaged" CAGE questionnaire (Appendix) was then administered. Each affirmative answer for any of the four items on the original CAGE questionnaire scored 1 point. The reason for choosing this AUD detection questionnaire against the AUDIT or other similar questionnaires was its greater brevity and ease of application, in addition to being a self-administered test, thus permitting the least possible interruption of consultation time (Ewing, 1984). Another advantage we considered important for this choice was that by being "camouflaged" within eight other questions about healthy lifestyle habits, patients did not even know that they were completing a questionnaire on alcohol use detection, which made the interview less intimidating and the answers more reliable (Castells et al., 2005).

Although in the first article published (Sánchez-Autet et al., 2018) we decided to use the cut-off point of ≥ 1 positive response for a positive screening, given the existing controversy over whether it should be ≥ 1 or ≥ 2 (Agabio et al., 2007; Bradley et al., 1998; Bush et al., 1987; Castells et al., 2005; Fiellin et al., 2000; Hearne et al., 2002; Liskow et al., 1995; Mayfield et al., 1974; Paz Filho et al., 2001), for our second article we decided to use both cut-off points for statistical analysis, i.e. a score of both ≥ 1 and ≥ 2 on the CAGE questionnaire.

Patients from outpatient mental health centers were classified into the following diagnostic categories: depressive disorders, psychotic disorders, anxiety disorders, personality disorders, bipolar disorders, borderline intellectual capacity (BIC), dementia, and attention deficit hyperactivity disorders (ADHD). Patients with BIC and dementia were included as long as their intellectual and cognitive capacity was sufficient to understand the study and respond adequately to the questions in the questionnaire. Outpatient drug addiction patients were classified according to dependence to each of the following substances: alcohol, canna-

bis, cocaine, heroin, cocaine plus heroin, and a final group which included other addictive behaviors (gambling, compulsive shopping, tobacco). If they used more than one substance, they were classified according to the main drug treatment problem.

To analyze the differences in the CAGE questionnaire scores by age, we decided to divide the sample into four subgroups (18-30 years, 31-45 years, 46-60 years and over 60 years).

Having samples from two geographical areas of the Spanish territory which are very far apart and have very different indices of rurality, Extremadura (the provinces of Cáceres and Badajoz) and Catalonia (Barcelona province), we decided to compare them in the search for possible differences. The index of rurality, or people living in municipalities with less than 5,000 inhabitants or with a maximum density of 300 inhabitants per km² (Goerlich & Cantarino, 2015), was 6.5% for the province of Barcelona, where the whole Catalonia Community sample was taken from, while in the provinces of Badajoz and Cáceres it was 44.5% and 51.2%, respectively (Goerlich et al., 2015).

Statistical analysis

After creating the database with all variables collected, statistical analysis was carried out with version 15.0 of SPSS (Statistical Package for the Social Sciences).

The three groups described were compared: outpatient psychiatric patients, outpatient drug addiction patients and healthy subjects. The same comparison was also carried out excluding patients with an AUD diagnosis from the group of outpatient drug addicts. A comparison was also made between the two autonomous communities in the healthy groups and psychiatric population, since a sample of drug-dependent patients could not be obtained from the Autonomous Community of Catalonia.

Statistically significant differences when testing hypotheses were considered when the associated p-value was below 0.05. For descriptive statistics, qualitative variables were expressed as frequencies and numbers, and quantitative variables as means and standard deviations.

The chi-square test was used to compare the qualitative variables. For the comparison of qualitative variables with quantitative variables, we compared means between the different qualitative variables by one-way analysis of variance (ANOVA) when the qualitative variables were non-dichotomous and by Student's t when they were dichotomous. Age, as a quantitative variable, is presented as mean ± standard deviation.

Results

Sample descriptives

A total of 1,054 participants were included in the study. The characteristics of the sample are described in Table 1, and the diagnoses and their percentages are shown in Table 2.

CAGE questionnaire scores

The average CAGE questionnaire score in the three groups was 0.88 ± 1.3. The average score for those attending psychiatric units was 0.74 ± 1.2; those with drug addiction 2.12 ± 1.55 and for the control group 0.55 ± 0.99 (F = 97.33; p < 0.001). Excluding patients with AUD among those attending drug addiction units, the average score for this group drops to 1.34 ± 1.48 (F = 14.7; p < 0.001). Table 3 shows the percentage of participants with each of the CAGE scores.

The CAGE score was higher in men than in women (1.21 ± 1.44 vs 0.50 ± 1.01; F = 42.67; p < 0.001). Analysis by age groups yielded the following results: from age 18 to 30 the score was 1.01 ± 1.25; from 31 to 45 years 0.86 ± 1.33; from 46 to 60 years 1.00 ± 1.36; and in people over 60 years 0.56 ± 1.08 (F = 4.62; p = 0.003). By diagnoses, we found that the highest CAGE scores were obtained in

Table 1. *Characteristics of the sample of participants: age and sex.*

Baseline characteristics		PSYCHIATRY		ADDICTION		HEALTHY		TOTAL	
		N	%	N	%	N	%	N	%
		588	55.8	153	14.5	313	29.7	1054	100
Age: mean-min-max (SD)		49.92	18-92 (14.06)	42.71	18-72 (12.35)	39.92	19-73 (10.89)	45.87	18-92 (13.72)
Age groups	18-30	58	10	28	18.4	46	14.7	132	12.6
	31-45	160	27.6	54	35.5	190	60.7	404	38.7
	46-60	234	40.4	58	38.2	56	17.9	348	33.3
	>60	127	21.9	12	7.9	21	6.7	160	15.3
Sex	Men	274	46.6	127	83.0	194	52.4	565	53.6
	Women	314	53.4	26	17.0	149	47.6	489	46.4

Note. Excluding patients with AUD (73 in total) from the addiction group, the average age of the remaining 80 patients is 36.81 ± 11.3 years.

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patients with ADHD with 2.00 ± 1.26 within the psychiatric group, and 1.79 ± 1.48 for patients with heroin addiction within the drug dependence group ($F = 19.64$; $p < 0.001$) if we excluded patients with AUD, who scored 2.99 ± 1.11 (Figs. I and II).

Within each of the four questions of the CAGE questionnaire, the question answered most frequently in the affirmative was question 1 and the least was question 4; this happened in the three groups and therefore also in the total sample (Table 4).

Positive results in the CAGE questionnaire

Taking a score ≥ 1 as a cut-off point in the CAGE questionnaire, 38.3% of the total sample screened positive, 34.2% of the patients in psychiatric units, 72.5% of those with addictions and 29.4% of the control group ($\chi^2 = 90.64$; $p < 0.001$). Taking ≥ 2 positive questions as the cut-off, these percentages fell to 26.6% in the total sample, to 22.6% in psychiatric units, to 64.7% in addictions and 15.3% in the control group ($\chi^2 = 139.02$; $p < 0.001$) (Table 5). Excluding patients with AUD from those attending drug addiction units, 51.3% of the remaining subjects with addictions had a score ≥ 1 in the CAGE questionnaire ($\chi^2 = 13.568$; $p = 0.001$) and 41.3% had a score ≥ 2 ($\chi^2 = 25.64$; $p < 0.001$) (Table 5).

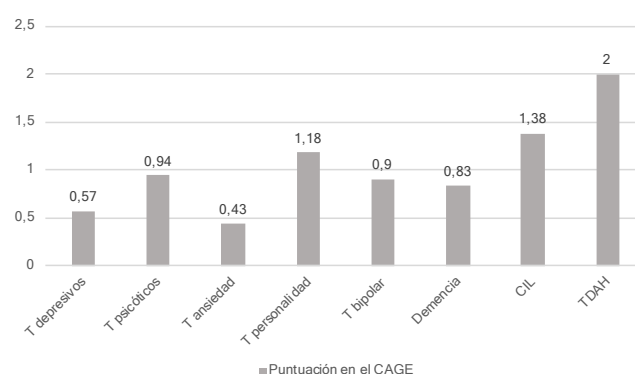Table 2. *Diagnoses included in the study and percentage of the total participants.*

Diagnosis	N	% of psychiatric patients	% of total sample
Depressive disorders	239	40.6	22.7
Psychotic disorders	133	22.6	12.6
Anxiety disorders	94	16	8.9
Personality disorders	51	8.7	4.8
Bipolar disorders	41	7.0	3.9
BIC	8	1.4	0.8
Dementia	6	1	0.6
ADHD	6	1	0.6
TOTAL PSYCHIATRIC	588	100	55.8
		% of addiction patients	
Alcohol	73	47.7	6.9
Cannabis	24	15.7	2.3
Cocaine (CC)	18	11.8	1.7
Heroin (H)	14	9.2	1.3
H + CC	14	9.2	1.3
Other addictive behaviors	9	5.9	0.9
TOTAL ADDICTIONS	153	100	14.5
HEALTHY	313	-	29.7
TOTAL SAMPLE	1054	-	100

Figure I. CAGE questionnaire scores
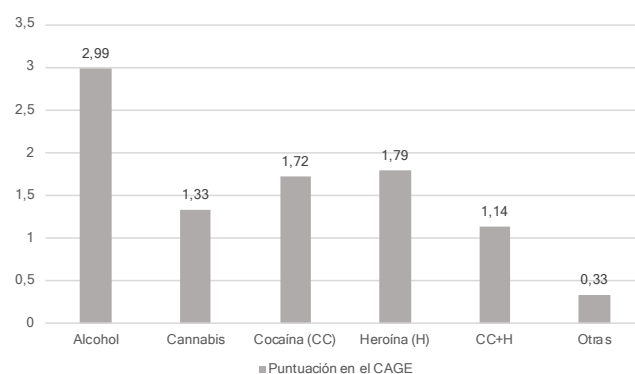by diagnostic group in psychiatry units.

Figure II. CAGE questionnaire scores
by diagnostic group in drug addiction units.

Table 3. *Percentage of participants with each of the CAGE scores.*

CAGE score	PSYCHIATRY		ADDICTION		HEALTHY		TOTAL	
	N	%	N	%	N	%	N	%
	588	55.8	153	14.5	313	29.7	1054	100
0	387	65.8	42	27.5	221	70.6	650	61.7
1	69	11.7	12	7.8	44	14.1	125	11.9
2	51	8.7	21	13.7	18	5.8	90	8.5
3	57	9.7	41	26.8	28	8.9	126	12
4	24	4.1	37	24.2	2	0.6	63	6

Note. $\chi^2 = 182.17$; $p < 0.001$.

By sex, 48.8% of men had a score ≥ 1 in the CAGE questionnaire, compared with 25.4% of women (χ^2 = 66.31; p < 0.001). The percentage of men with a score ≥ 2 was 37.4% and women 13.8% (χ^2 = 74.33; p < 0.001). Table 5 describes the differences according to sex and the diagnosis on the CAGE scale for each study group. The diagnoses with a higher percentage of patients with positive screening for AUD were: ADHD, at both cut-off points, in psychiatric units; and heroin addiction at the ≥ 1 cut-off point and cocaine addiction at ≥ 2 in drug addiction units after excluding alcohol addiction from the latter (Table 5). The differences between the different diagnoses were significant, at both the ≥ 1 cut-off point (χ^2 = 138.41; p < 0.001) and ≥ 2 (χ^2 = 177.55; p < 0.001).

By age group, the following results were obtained: from 18 to 30 years of age 50% had a score of ≥ 1, from 31 to 45

Table 4. *Affirmative responses to the different CAGE questionnaire items by groups.*

CAGE question	Psychiatry (n=588)	Addictions (n=153)	Healthy (n=313)	Total (n=1054)	Test	P
CAGE 1: Have you ever felt you needed to cut down on your drinking (n, % "yes")	136 (23.1%)	103 (67.3%)	66 (21.1%)	305 (28.9%)	χ^2 =128.64	‹0.001
CAGE 2: Have people annoyed you by criticizing your drinking? (n, % "yes")	126 (21.4%)	79 (51.6%)	54 (17.3%)	259 (24.6%)	χ^2 =72.64	‹0.001
CAGE 3: Have you ever felt guilty about drinking? (n, % "yes")	123 (20.9%)	92 (60.1%)	46 (14.7%)	261 (24.8%)	χ^2 =124.41	‹0.001
CAGE 4: Have you ever felt you needed a drink first thing in the morning (eye-opener) to steady your nerves or to get rid of a hangover? (n, % "yes")	57 (9.7%)	51 (33.3%)	6 (1.9%)	114 (10.8%)	χ^2 =106.89	‹0.001

Table 5. *Percentage of participants with positive CAGE questionnaire screening for alcohol use disorder (cut-off points ≥ 1 and ≥ 2) by diagnosis and sex.*

Diagnosis		N	CAGE ≥ 1		P	CAGE ≥ 2		P
			N	%		N	%	
Depressive disorders	T	239	69	28.9		39	16.3	
	M	88	34	38.6	0.002	21	23.9	0.049
	W	149	33	22.1		18	12.1	
Psychotic disorders	T	133	53	39.8		41	30.8	
	M	80	45	56.3	‹ 0.001	36	45	‹ 0.001
	W	53	8	15.1		5	9.4	
Anxiety disorders	T	94	21	22.3		11	11.7	
	M	44	14	31.8	0.038	9	20.5	0.013
	W	50	7	14		2	4	
Personality disorders	T	51	24	47.1		19	37.3	
	M	17	10	58.8	NS	9	52.9	0.027
	W	32	12	37.5		8	25	
Bipolar disorders	T	41	18	43.9		12	29.3	
	M	23	12	52.2	NS	9	39.1	NS
	W	18	6	33.3		3	16.7	
BIC	T	8	3	37.5		3	37.5	
	M	6	2	33.3	NC	2	33.3	NC
	W	2	1	50		1	50	
Dementia	T	6	2	33.3		1	16.7	
	M	3	1	33.3	NC	0	0	NC
	W	3	1	33.3		1	33.3	
ADHD	T	6	5	83.3		4	66.7	
	M	4	3	75	NC	3	75	NC
	W	2	2	100		1	50	

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Diagnosis		N	CAGE ≥ 1		P	CAGE ≥ 2		P
			N	%		N	%	
TOTAL PSYCHIATRY	T	588	201	34.2		133	22.6	
	M	270	124	45.9	‹ 0.001	91	33.7	‹ 0.001
	W	309	70	22.7		39	12.6	
Alcohol	T	73	70	95.9		66	90.4	
	M	61	59	96.7	NS	55	90.2	NS
	W	12	11	91.7		11	91.7	
Cannabis	T	24	12	50		9	37.5	
	M	19	9	47.4	NS	7	36.8	NS
	W	5	3	60		2	40	
Cocaine (CC)	T	18	12	66.7		11	61.1	
	M	16	10	62.5	NC	9	56.3	NC
	W	2	2	100		2	100	
Heroin (H)	T	14	10	71.4		7	50	
	M	14	10	71.4	-	7	50	-
	W	-	-	-		-	-	
H + CC	T	14	6	42.9		5	35.7	
	M	13	5	38.5	NC	4	30.8	NC
	W	1	1	100		1	100	
Other addictive behaviors	T	9	1	11.1		1	11.1	
	M	3	1	33.3	NC	1	33.3	NC
	W	6	0	0		0	0	
TOTAL DRUGS	T	153	111	72.5		99	64.7	
	M	127	94	74	NS	83	65.4	NS
	W	26	17	65.4		16	61.5	
TOTAL DRUGS EXCL. AUD	T	80	41	51.3		33	41.3	
	M	66	35	53	NS	28	42.4	NS
	W	14	6	42.9		5	35.7	
Diagnosis		N	CAGE ≥ 1		P	CAGE ≥ 2		P
			N	%		N	%	
HEALTHY	T	313	92	29.4		48	15.3	
	M	164	56	34.1	NS	36	22	0.001
	W	149	36	24.2		12	8.1	
TOTAL SAMPLE	T	1054	404	38.3		280	26.6	
	M	561	274	48.8	‹ 0.001	210	37.4	‹ 0.001
	W	484	123	25.4		67	13.8	

Nota. T: Total; M: Men; W: Women; AUD: Alcohol Use Disorder; NS: not significant; NC: not calculable.
P=significance of sex within each diagnosis, using the Pearson chi-square test (χ^2)

years 35.6%, from 46 to 60 years 40.8%, and in those over 60 years 27.5% ($\chi^2 = 17.68$; p = 0.001). The percentage of those with a score ≥ 2 was 28.8% in participants aged 18 to 30, 24.8% aged 31 to 45, 32.2% aged 46 to 60, and 16.3% in people over 60 ($\chi^2 = 15.41$; p = 0.001).

Within the healthy sample and separating them by age group, significant differences were obtained for the percentage of healthy subjects with positive screening for AUD at a score of ≥ 1 ($\chi^2 = 12.65$; p = 0.005), but not at ≥ 2 ($\chi^2 =$ 5.17; p = 0.160), and differentiating by sex only at a score of ≥ 2 (Table 6).

Differences between autonomous communities

Of the 1,054 patients in the sample, 651 (61.8%) were from the Autonomous Community of Extremadura (provinces of Badajoz and Cáceres) and 403 (38.2%) from the Autonomous Community of Catalonia (province of Barcelona). Of the 588 from outpatient psychiatric units, 262

(44.6%) were from Extremadura and 326 (55.4%) from Catalonia. All 153 of those in drug addiction units were from Extremadura. Of the total healthy subjects (313), 236 (75.4%) were Extremaduran and 77 (24.6%) Catalan (Table 7).

The average age of Extremaduran and Catalan psychiatric patients was very similar: 49.85 ± 14.78 and 49.98 ± 13.5, respectively (F = 0.011; p = 0.915), as was the average age of healthy Extremaduran and Catalan subjects: 39.95 ± 11.14 and 39.82 ± 10.13, respectively (F = 0.008; p = 0.927).

Among those attending outpatient psychiatric units, the CAGE score in the sample from the Autonomous Community of Catalonia was 0.80 ± 1.21, and in the Autonomous

Community of Extremadura sample it was 0.68 ± 1.18 (F = 1.41; p = 0.235). Meanwhile, the 77 healthy participants from Catalonia had an average CAGE score of 0.29 ± 0.60 and the 236 from Extremadura 0.64 ± 1.07 (F = 7.4; p = 0.007). Table 7 shows the percentage of psychiatric patients and healthy subjects who had ≥ 1 and ≥ 2 positive responses in the CAGE questionnaire separated by sex and autonomous community.

Discussion

Our study is the first that we have found in the literature which assesses the prevalence of AUD using the camoufla-

Table 6. *Percentage of healthy subjects screening positive on the CAGE questionnaire for alcohol use disorder (cut-off points ≥ 1 and ≥ 2) by age group and sex.*

HEALTHY		N	CAGE ≥ 1		P	CAGE ≥ 2		P
			N	%		N	%	
18-30 years	T	46	23	50		12	26.1	
	M	25	15	60	0.139	9	36.0	0.095
	W	21	8	38.1		3	14.3	
31-45 years	T	190	52	27.4		27	14.2	
	M	97	31	32	0.147	20	20.6	0.010
	W	93	21	22.6		7	7.5	
46-60 years	T	56	12	21.4		7	12.5	
	M	32	9	28.1	0.158	7	21.9	0.014
	W	24	3	12.5		0	0	
Over 60 years	T	21	4	19		2	9.5	
	M	10	0	0	0.034	0	0	0.156
	W	11	4	36.4		2	18.2	
Total	T	313	91	29.4		48	15.3	
	M	164	55	33.5	0.060	36	22	0.039
	W	149	36	24.2		12	8.1	

Nota. T: Total; M: Men; W: Women. P = significance of sex within each diagnosis, using the Pearson chi-square test (χ^2).

Table 7. *Number of participants and percentage of positive screenings at ≥ 1 and ≥ 2 with the CAGE Questionnaire and the differences between participants from Extremadura and Catalonia, in psychiatric and healthy patients, and separated by sex.*

Variable		PSYCHIATRIC		P	HEALTHY		P
		Extremadura	Cataluña		Extremadura	Cataluña	
CAGE ≥ 1	T	80 (30.5%)	121 (37.1%)	0.094	75 (31.8%)	16 (20.8%)	0.065
	M	51 (42.9%)	73 (48.3%)	0.369	49 (35.5%)	6 (23.1%)	0.218
	W	22 (16.4%)	48 (27.4%)	0.022	26 (26.5%)	10 (19.6%)	0.349
CAGE ≥ 2	T	52 (19.8%)	81 (24.8%)	0.150	42 (17.8%)	6 (7.8%)	0.034
	M	41 (34.5%)	50 (33.1%)	0.817	32 (23.2%)	4 (15.4%)	NC
	W	8 (6%)	31 (17.7%)	0.002	10 (10.2%)	2 (3.9%)	NC
TOTAL	T	262	326		236	77	
	M	124 (47.3%)	151 (46.3%)		138 (58.5%)	26 (33.8%)	
	W	138 (52.7%)	175 (53.7%)		98 (41.5%)	51 (66.2%)	

Nota. T: Total; M: Men; W: Women; NC= Not calculable. P = significance of autonomous community, using the Pearson chi-square test (χ^2).

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ged CAGE questionnaire, not only in psychiatric patients, already described in the first article (Sánchez-Autet et al., 2018), but also compared with substance dependent patients and healthy subjects. When comparing these groups with the camouflaged CAGE questionnaire, we found that in our sample there is a higher percentage of positive screenings in substance dependent patients than in psychiatric patients, which is also higher in the latter than in healthy individuals (Table 5). Furthermore, the score on this questionnaire is higher in drug addiction than in psychiatric units, and higher in these than in healthy subjects. Even excluding patients diagnosed with AUD from the drug addiction unit totals, patients in addiction units maintained a higher percentage of positive screenings and a higher score, both statistically significant, than psychiatric patients and healthy controls.

In the sample of outpatient psychiatric patients, as described in the first part of our study (Sánchez-Autet et al., 2018), positive screening with CAGE in men and in those aged under 60 was more frequent. By diagnosis, we found that serious mental disorders were those which had higher rates of positive CAGE scores: personality disorders, bipolar disorders and psychotic disorders, with figures close to 50%, corresponding to findings in the literature (Mellos, Liappas & Paparrigopoulos, 2010; Mueser, Drake & Wallach, 1998; Mueser et al., 2000).

In the specific case of bipolar disorders, we found 43.9% of patients with a CAGE score ≥ 1, 52.2% in men and 33.3% in women. Epidemiological studies with large samples have found a similar proportion to this in subjects with type I bipolar disorder: in the RCT (Epidemiological Catchment Area Study, ECA; Regier et al., 1990), 46% had a history of alcohol abuse/addiction, and 45% in the Edmonton Study (Fogarty, Russell, Newman & Bland, 1994). In the ECA (Regier et al., 1990), the prevalence of alcohol use varied according to the different psychiatric diagnoses: the 46% referred to above for type I bipolar disorder, 39.2% for type II bipolar disorder and 33.7% for schizophrenia. Frye et al. (2003) found that alcohol abuse was more frequent in men with bipolar disorder than in women, with figures very similar to ours, 49% vs. 29%, respectively, who met criteria of lifetime alcoholism, although the relative risk of alcohol abuse compared to the general population was higher in bipolar women than in men, with an odds ratio of 7.35 vs 2.77, respectively. A study conducted in Badajoz, also within the Autonomous Community of Extremadura, on patients hospitalized with a bipolar disorder diagnosis (Zamora-Rodríguez et al., 2018), showed 28.8% of patients with alcohol abuse or addiction criteria.

On the other hand, anxiety and depressive disorders did not appear to be a risk factor for presenting AUD in our sample since they had very similar rates of screening positive with CAGE, even lower than those presented by the healthy sample, which contradicts previous articles

(Anthenelli, 2012; Grant et al., 2004), although conflicting results have been obtained in the case of anxiety disorders (Goldstein, Smith, Dawson & Grant, 2015; Hasin & Kilcoyne, 2012; Sánchez-Autet et al., 2018). The diagnosis presenting the highest percentage of positive screenings with both cut-off points, ≥ 1 and ≥ 2, was ADHD, albeit with just six patients with this pathology; this ADHD-alcohol use ratio has already been described in the literature (Biederman et al., 1995; Weiss & Hechtman, 1993; Wilens, Biederman, Mick, Faraone & Spencer, 1997).

Regarding the sample of patients being treated in drug addiction centers, the fact that those who were being treated for alcohol addiction answered at least one question affirmatively in 95.9% of the cases indicates the high sensitivity of CAGE. This sensitivity dropped to 90.4% when the cut-off point was raised to two affirmative questions. We have already noted that the sensitivity of the CAGE questionnaire varied in different studies from approximately 70% to 90%, being higher for the cut-off point of one affirmative answer and decreasing when increased to two, although with increased specificity in this case (Berks & McCormick, 2008; Corradi-Webster et al., 2005; Dervaux et al., 2006; Dhalla et al., 2007; Mitchell et al., 2014).

In the rest of addictive substances (cannabis, cocaine, heroin, cocaine + heroin), we found a much higher percentage of positive results in the CAGE questionnaire than in healthy participants or in psychiatric patients. In these groups of substances, the percentage of positive screenings is very similar in men and women, in some cases being even higher for the latter. This association between the use of different substances and alcohol use has been described previously (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2017; Font-Mayolas, Gras & Planes, 2006; Font-Mayolas et al., 2013; Kandel & Yamaguchi, 1985), showing that the use of one of these substances is linked to the use of alcohol. Kandel et al. (1985) affirmed that the use of legal drugs could facilitate the subsequent use of marijuana, which in turn would open the door to the use of other illicit drugs in accordance with the escalation model. According to data from the EDADES (2017) survey, alcohol is present in more than 90% of polydrug use, with percentages close to 100% when the number of substances consumed was four or more (Delegación del Gobierno para el Plan Nacional sobre Drogas, 2017).

It is noteworthy that in the control sample of healthy subjects (Table 6) we find almost one third (29.4%) with a CAGE score of ≥ 1 and almost one sixth (15.3%) with a score of ≥ 2, prevalences higher than those obtained in other national and international studies. In the aforementioned 2017 EDADES survey (Government Delegation for the National Drug Plan, 2017), the AUDIT test showed that 5.1% of Spaniards aged 15 to 64 were classified within the high-risk category of alcohol use (7.6% of men and 2.6% of women), figures much lower than ours. Other research

using the CAGE questionnaire with 2 affirmative answers as a cut-off point, carried out in Portugal on patients undergoing surgery (Sousa, Pinho, Santos & Abelha, 2017), in France on people attending hospital emergency departments (Richoux et al., 2011) or in Brazil on public transport workers (Cunha, Giatti & Assunção, 2016), also found a lower prevalence than ours.

The percentage of positive CAGE screenings in healthy individuals was higher the younger the sample, and in men compared to women (33.5% vs 24.2% with score ≥ 1 and 22% vs 8.1% with score ≥ 2); however, it can be noted that in women over 60 years of age it was higher than in men of the same age group, although it is also true that in this age group the percentage of participants was lower (Table 6). Another Brazilian article on 192 workers on the campus of the University of São Paulo (Amaral and Malbergiera, 2004) with a ≥ 2 cut-off point, a greater percentage was also observed in men than in women (22.1% vs 0 %, with only 20 women analyzed); these results are similar to ours, although they did not yield the same distribution by age groups (being much higher in people aged over 60), an issue that could be explained by the low number of participants in some groups, as well as socio-cultural differences, among others.

A study carried out in Singapore with 2,565 healthy people aged over 60 (Ong et al., 2016) found 4.2% with a CAGE score ≥ 2, compared to 9.5% in our healthy Spanish sample in the same age range. In their study, this frequency was higher in men, of Indian ethnicity and who were separated or divorced. Other articles even point to a lower percentage in people over 60, such as Almeida et al. (1997), in which only 1.42% of a total of 351 had a score ≥ 2. A recent study (Lycke et al., 2019) carried out in cancer patients with a mean age of 77.7 years found 6.3% of men and 1.2% of women with positive results (≥ 2) with CAGE.

Research carried out in three European countries (Bulgaria, Germany and Poland) with 2,103 university students (Mikolajczyk et al., 2016) also found a percentage of people with positive CAGE screening (score ≥ 2) which much lower than ours: 22.7%, 26.3% and 19% respectively in Bulgaria, Germany and Poland for men, and 9.6%, 9.3% and 8.5% for women, which contrasts with 36% for men and 14.3% for women in our sample of healthy 18-30-year-olds, which is the most similar by age group to that of university students. Similar studies on samples of young Italian adults aged 18 to 35 (Manzoli et al., 2009) or on Canadian medical students (Thakore et al., 2009) or other recent studies on samples of medical students in different countries of the world: Wales (Farrell et al., 2019), Portugal (Almeida, Kadhum, Farrell, Ventriglio & Molodynski, 2019), Morocco (Lemtiri Chelieh et al., 2019), Canada (Wilkes et al., 2019), Brasil (Castaldelli-Maia et al., 2019), Paraguay (Torales et al., 2019) and Jordan (Masri et al., 2019) also showed a lower prevalence of positive screening with CAGE (score ≥ 2), ranging from 5% of Moroccans to 25% of Brazilians, than healthy participants aged 18 to 30 in our study, reaching 26.1%, including both men and women.

Although our study focused on patients aged 18 or older, drinking among patients under 18 years of age is also noteworthy. A recent study (Teixidó-Compañó et al, 2019) using data from the Survey on drug use in Secondary Education in Spain (ESTUDES, 2014) with 14-18-year-old students (N = 34,259) obtained a total prevalence of binge drinking in the previous month of 33%, a prevalence which increased with age, and was mainly associated with the perception of easy access to alcohol, its consumption in open areas, having one of two parents who allows drinking and having more than €30 to spend per week.

These data should make us think about the high levels of alcohol use among the apparently healthy Spanish population, which is higher than shown by other studies, both in European countries and the rest of the world, and the possible repercussions on their health, with greater disability and mortality, leading to higher health and social costs (Pulido et al., 2014; Rehm et al., 2013).

Regarding the influence of rurality in our results, it should be noted that among the Catalan and Extremaduran samples of outpatient psychiatric units, comparable in mean age and sex, we found a certain tendency for greater positive screening with CAGE in the Catalan sample (a more urban sample), the difference being statistically significant in women. We also found significant differences between both autonomous communities in the samples of healthy individuals with the ≥ 2 cut-off, but in this case in favor of the (more rural) Extremadura sample. As previously noted, different studies carried out in different Spanish autonomous communities in the general population obtained a prevalence of positive screenings with the CAGE questionnaire at the ≥ 2 cut-off of between 4.0% and 8.7% (Alvarez et al., 1994; Alvarez et al., 2006; Anitua et al., 1998; Dirección General de Atención Primaria, 2001; Dirección General de Atención Primaria, 2006; Dirección General de Atención Primaria, 2011; Pérez et al., 2010; Servicio de Estudios e Investigación Sanitaria, 2004), figures below the Extremadura sample of healthy subjects (17.8%) and similar to the Catalan (7.8%).

The most important limitations of our study, already mentioned in the first published part (Sánchez-Autet et al., 2018), are mainly the absence of a structured diagnostic interview to confirm the positive screening obtained with CAGE and the non-collection of other sociodemographic, medical or substance use data. One of its main strengths is the large number of participants (1,054) and the inclusion of three different samples: healthy individuals, patients of outpatient psychiatric centers and patients of outpatient drug addiction units, which allows us to establish comparisons between individuals of the same health areas. The results obtained seem to be in line with expectations based

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on previous experience and literature, which supports the theoretical validity of the questionnaire used.

In conclusion, the data found in our analysis speak of greater positive screening for alcohol use in patients attending drug addiction units compared to psychiatric patients, and in the latter compared to a sample of healthy subjects. Also noteworthy is the high rates of AUD in both psychiatric patients, especially those with severe mental disorders, as well as in healthy subjects; however, this is a frequently underdiagnosed pathology, and therefore not treated, with the consequences this implies in terms of worsening quality of life, higher rates of associated disease and greater mortality. It may therefore be worth considering the need to include specific screening elements for alcohol use, such as the simple and easy to use CAGE, both in psychiatric services and primary care, and even with hospital patients.

Acknowledgments

Conflict of interests

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Appendix

Camouflaged CAGE questionnaire, adapted for Spanish patients.

1. Do you think you eat too many sweet things?
2. Have you ever been offered a joint or a dose of cocaine?
3. Have people annoyed you by criticizing your drinking?
4. Have you ever thought about exercising weekly?
5. Do you think you sleep enough hours to feel fit during the day?
6. Have you ever thought that you should cut down on your drinking?
7. Have you ever seriously considered that you should quit smoking?
8. Have people ever told you that you should eat more fruit and vegetables?
9. Have you ever felt guilty about drinking?
10. Have you ever been told that you should smoke less?
11. Have you ever felt you needed a drink first thing in the morning (eye-opener) to steady your nerves or to get rid of a hangover?
12. Have you ever considered swapping the habit of taking sleeping pills for relaxation techniques?